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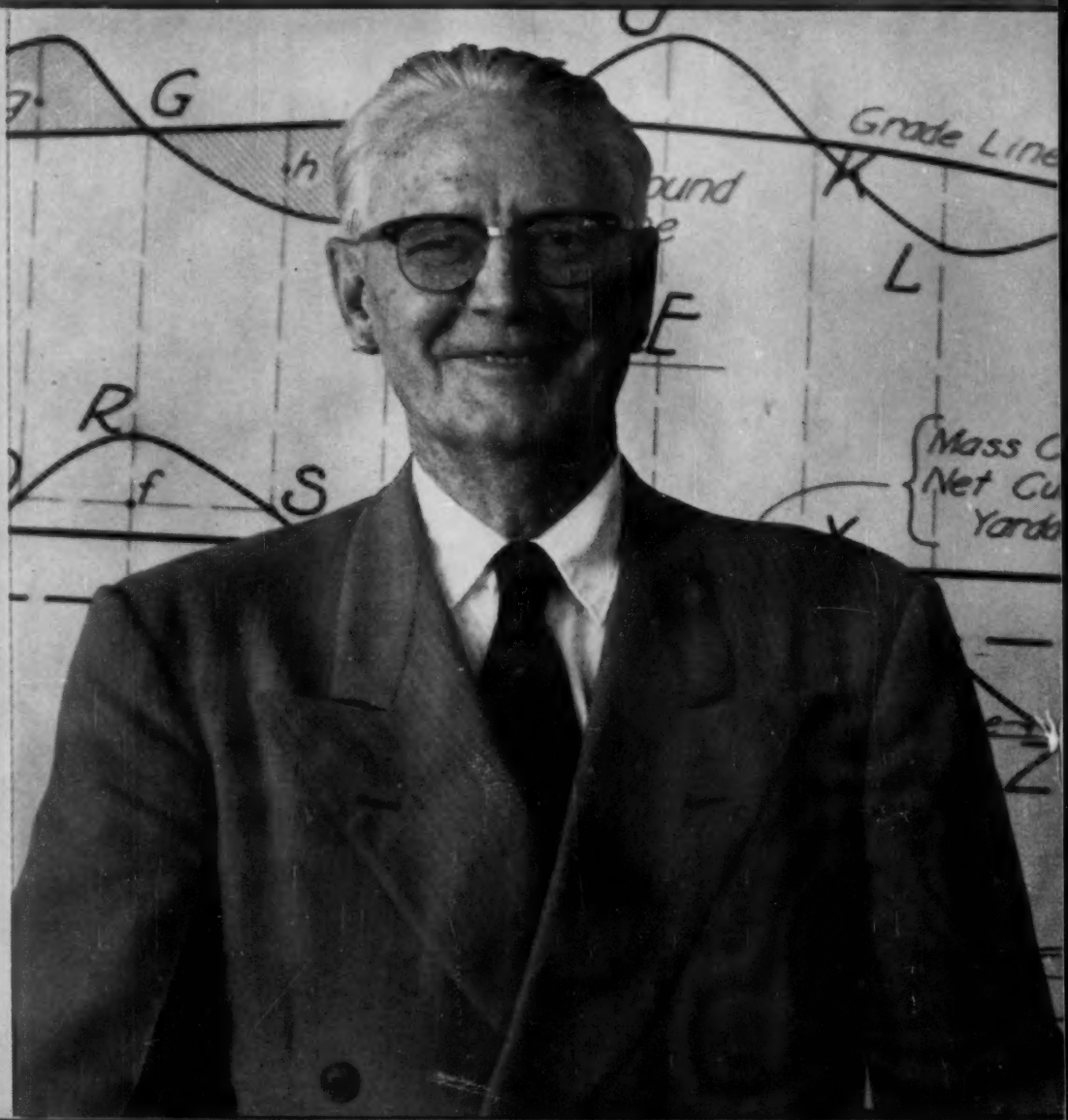


Ben H. Petty is Professor of Highway Engineering at Purdue University. Active in the ARBA and the Highway Research Board, he supervises the annual Purdue Road School and edits the proceedings. **More on page 30**

GALION HYDRAULIC BOOSTER STEERING

NO "WHEEL FIGHT" --you will enjoy steering!

Galion Motor Graders with hydraulic booster steering do more and better work because the operator will do a better job of maneuvering the grader.

- Steer with practically no effort.
- Combines the confident "feel" of manual steering with the ease of power steering.
- Complete easy control at all times.
- Steering wheel tugging is eliminated, shocks are absorbed. Less operator fatigue.
- GALION gives you the safest and most dependable of all grader steering systems.
- Hydraulic booster steering is STANDARD EQUIPMENT on Galion Models 118, 104, 450 Motor Graders.

B & L ELEVATING GRADER ATTACHMENT

The speedy, low cost method of casting, stripping, loading and terracing.

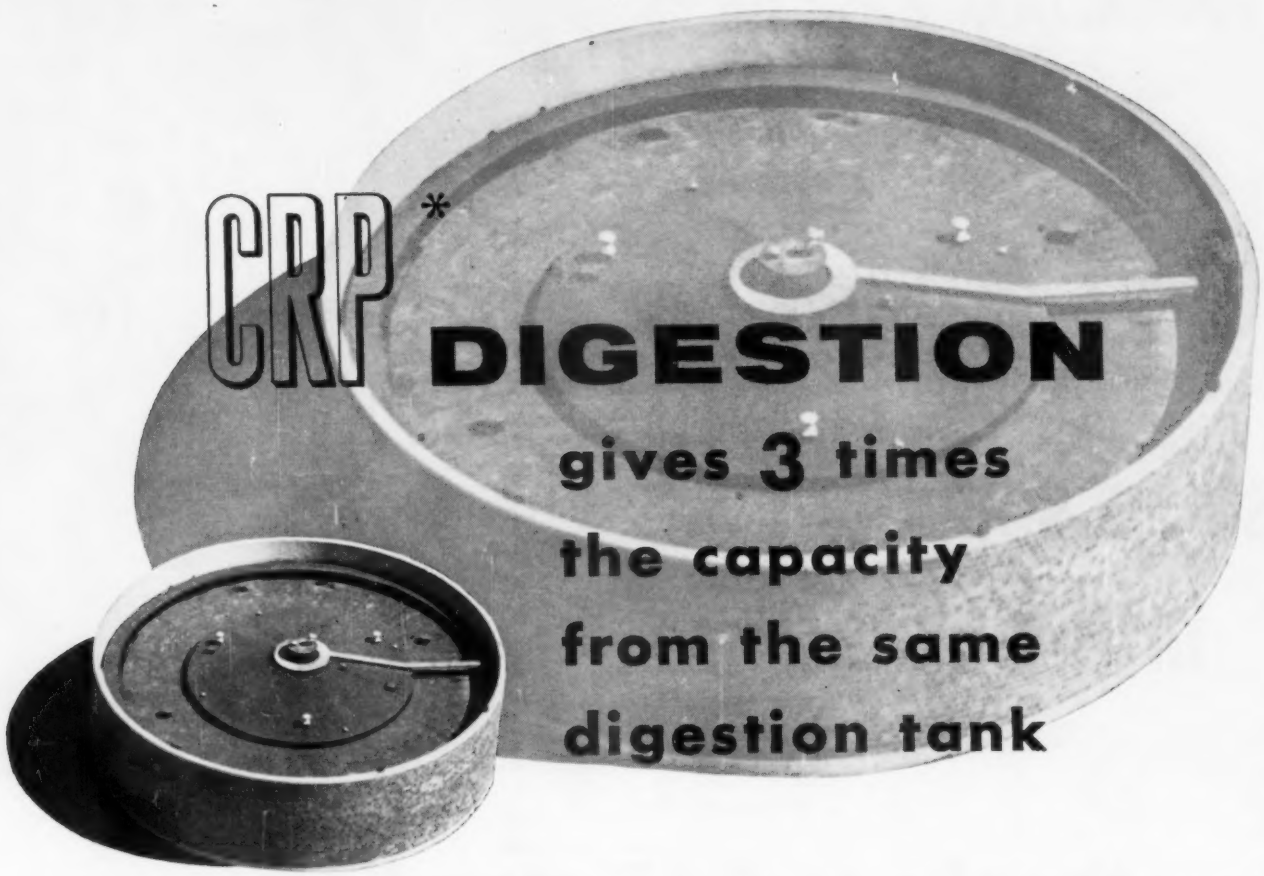
Hydraulic Booster Steering is STANDARD EQUIPMENT on GALION Models 118, 104, 450 MOTOR GRADERS

ESTABLISHED GALION 1907

MOTOR GRADERS · ROLLERS

TRENCH ROLLERS · PORTABLE ROLLERS · 3-WHEEL ROLLERS · TANDEM ROLLERS · MOTOR GRADERS

THE GALION IRON WORKS & MFG. CO., General and Export Offices, Galion, Ohio, U.S.A.
Cable address: GALIONIRON, Galion, Ohio



CATALYTIC REDUCTION PROCESS* Triples Sludge Digestion Rate to Boost Digestion Tank Capacity

The CATALYTIC REDUCTION PROCESS is the only proved process for accelerating biological digestion. Originating in 1946, the PROCESS was developed, tested and verified over six years on both laboratory and plant scale. The results have been proven in full scale plant operation at the Columbus, Ohio and Erie, Pennsylvania Sewage Treatment Plants. The PROCESS is now being installed in seven other cities.

DETAILS OF ONE TEST

The CATALYTIC REDUCTION PROCESS applied to one 70′ tank at the Columbus Plant digested 3.38 times the quantity of sludge solids digested in a similar tank in parallel operation not using the PROCESS. The tank operating under the PROCESS produced a reduction of solids within established ranges, normal gas production and readily driable odorless sludge.

PREVENTS FLOATING DIGESTIBLE SOLIDS

By providing accelerated digestion, the CATALYTIC REDUCTION PROCESS offers the only fundamental and satisfactory method for preventing deep surface accumulation (sometimes mistakenly called scum) of digestible solids that are symptomatic of inadequate digestion. CRP simultaneously accelerates and uniformly digests ALL digestible solids.

Reports Available

Reports describing the PROCESS in detail are available on request. Write:

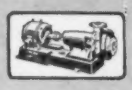
CHICAGO PUMP COMPANY

Subsidiary of Food Machinery and Chemical Corporation

SEWAGE EQUIPMENT DEPARTMENT

622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

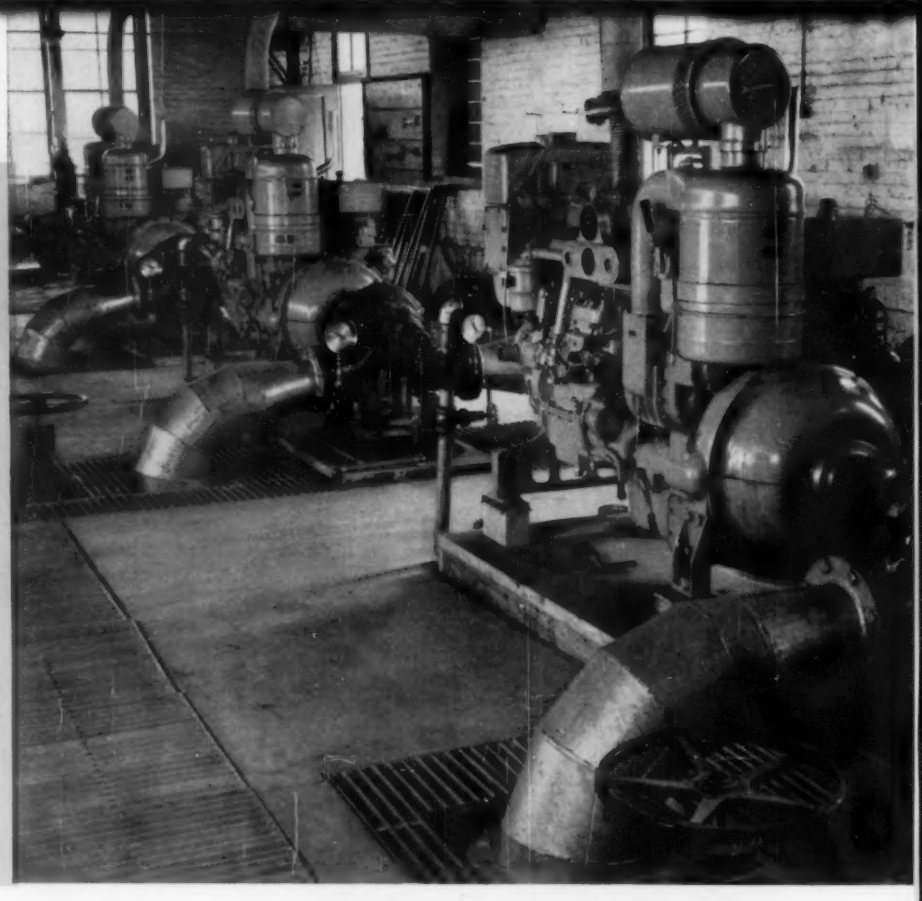
Flush Kleen, Scru-Peller, Plunger. Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers.



Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

** Patents Applied For*

People sleep soundly in Pueblo



. . . thanks to CAT* standby power

Pueblo, Colorado, may need power in a hurry some day. If it does, nobody's worrying about the water supply. That's protected by the most reliable standby power available—Caterpillar power. Three D337 Engines, in the Public Water Works plant, District No. 2, are ready to swing into action to keep the 2350-gallon-per-minute 8″ x 8″ pumps running!

Why did Pueblo install Caterpillar Diesels? Here's the answer from Superintendent Fred B. Dunlap: "We had evidence of Caterpillar dependability in our D2 Tractor, which we've used for a long time. And the D337s fitted our specifications exactly, so we bought them."

Performance records in municipal plants all over the country back up Mr. Dunlap's judgment. Besides reliability, these rugged yellow units offer many other advantages. For example: Easy, low-cost installation. They take up little space and don't require big concrete bases or expensive wall or overhead construction. Easy to operate and maintain, they don't need the attention of high-salaried personnel. And they burn low-cost No. 2 furnace oil without fouling—another saving. What's more, they're *honestly* rated. The power they promise in the specification sheets is the working power you can count on in your plant!

What are your needs? You'll find exactly the right unit, or combination of units, in the Caterpillar line —engines and electric sets in 12 sizes up to 500 HP and 315 KW. Your local Caterpillar Dealer is a source of prompt service any time of the day or night. Ask him to show you proof of performance!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

CAT POWER MEANS DEPENDABLE PERFORMANCE

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PUBLIC WORKS MAGAZINE

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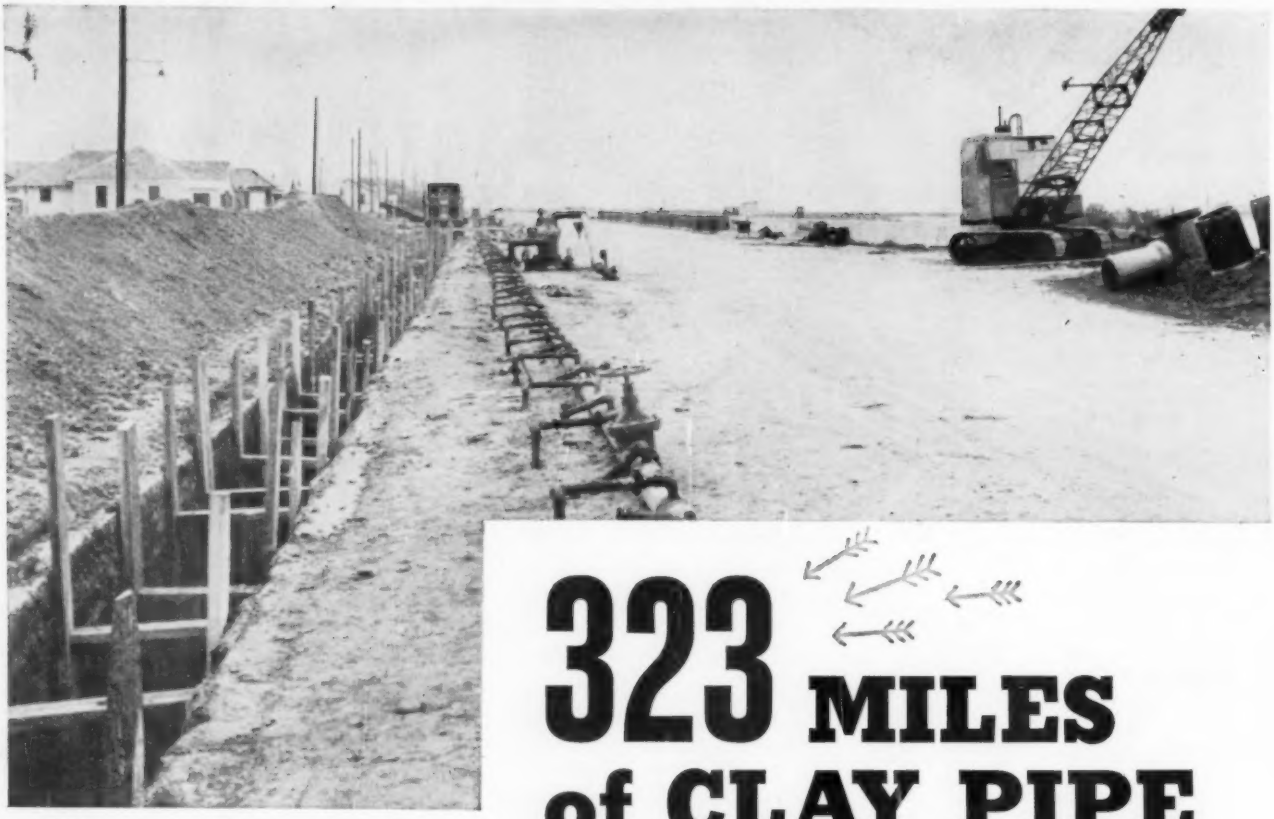
THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES



This Clay Pipe Sewer in Texas City was designed by Joe J. Rady & Co., consulting engineers, who also supervised the installation. The line runs along Galveston Bay. At some points it had to be laid in quicksand six feet below sea level.

323 MILES of CLAY PIPE

Provide Modern Sewerage for Galveston County, Texas

More than 1,700,000 feet of Clay Pipe have been installed in Galveston County in the past 18 years to meet the needs of expanding industry and a growing population. When Joe J. Rady & Co. first began work in Galveston in 1937, only two cities in the county had sewerage systems. Today, Clay Pipe sewerage systems have been installed in every community of 1,000 population or more. Referring to infiltration, which has always been a big problem in this area, Mr. Rady says: "This naturally dictated the *exclusive use of Vitrified Clay Pipe,* which has been specified on each and every sewerage collection system."

Next time you specify, buy, or install sewer pipe, remember this fact: engineers who handle the big, long-range projects specify and recommend Vitrified Clay Pipe. *It's guaranteed for 50 years. It never wears out.*

CLAY PIPE FITTINGS are available to help solve every installation problem. This Cut Curve, for example, is available in sizes through 36".

Vitrified
CLAY
CLAY PIPE NEVER WEARS OUT!
PIPE

NATIONAL CLAY PIPE MANUFACTURERS, INC.
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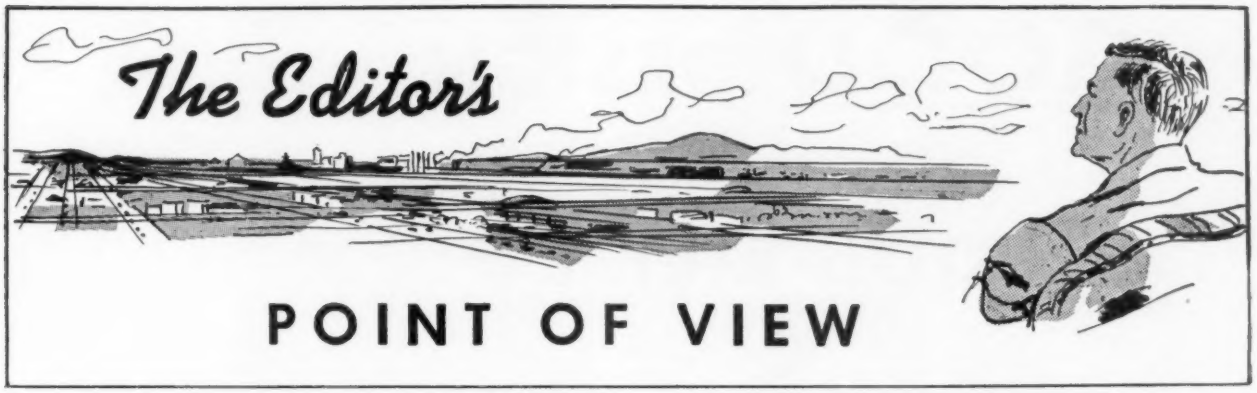
703 Ninth & Hill Bldg., Los Angeles 15, Calif.
100 N. LaSalle St., Rm. 2100, Chicago 2, Ill.
206 Connally Bldg., Atlanta 3, Ga.

C-754-2

Now's the time to mail this month's Readers' Service card.



More and Better Public Works for the Coming Year

EVERY year the job of meeting the public works needs of the nation, of the states, of cities and of counties gets bigger and more important. This country cannot continue to prosper unless the essential public works services—highways, water supply, waste disposal and their related functions—are continually improved and expanded. To do this within our financial resources, we must develop newer and better equipment and materials and we must use these intelligently and efficiently. This is the theme for PUBLIC WORKS for 1955.

For the coming year, therefore, we have scheduled a series of major articles which will furnish most useful and practical information on these various phases of public works. The articles will be long and complete; and for authors we have gone to men of acknowledged leadership in their respective fields. In addition to these, there will be many of the finest articles it is possible for us to get on design, maintenance and operation. Special attention will be paid to the methods for getting the most service from our present highway system by modern methods of traffic control; to design and operation of water, sewage and industrial waste treatment plants; to modern street lighting; to better refuse collection and disposal; and to research and development.

We shall continue the use of four-color pictures of engineering works and we shall strive for better make-up to promote even greater ease in reading. We thank our readers for their help and their good will during the past year and we hope that we will continue to hear from them through articles and other contributions and in person.

A Happy New Year to all.

Factors in Sanitary Engineering Education

BECAUSE sanitary engineering is a relatively recent offshoot of civil engineering, there has been some disagreement and uncertainty among educators as to the type and scope of training that should be given. A "best" curriculum has not yet been agreed on. There is, however, a stirring among educators, and this is all to the good.

Sanitary engineering training cannot make a man a good engineer and also make him able to compete in chemistry with a graduate chemist, or in entomology with a graduate entomologist, and so on. But it should make him a good engineer and also it should train him to work with other professional specialists, to understand what they can do and to know how their skills can be utilized in and coordinated with his work. Also, and most important of all, because the sanitary engineer so often works alone or nearly so, his training must give him imagination, resourcefulness, persistence and ability to get along with others.

Basic Public Works Needs Should be Provided in Time

NO less than eighteen cities in Georgia suffered serious or embarrassing water shortages during the past summer; probably there were quite a few others of which we have no record. Some of these failures were due to inadequate supply; others to lack of storage or treatment facilities. Every one of them involved extra expense for emergency measures and interference with the normal daily life of the community.

It is easy to look the other way when the need for more public works is brought up. It is easy to put off, and put off again, doing what needs to be done. But the community always pays for what it doesn't get, and sometimes excessively.

We need to keep our public works up to date, ample to meet the requirements of daily business and living standards. Without public works, we are back in the dark ages; we can't do without them; and we pay for them whether we have them or not.

There Are Still Some Problems in Port and Ship Water Supply

AN outbreak of gastroenteritis is reported by the Navy which was determined to be due to one of those T connections with potable water on one side and salt water on the other. The salt water hose drew from near the port scuppers of the ship. A contributing factor, which should be noted by health department personnel, was the fact that the identifying marks to distinguish potable and polluted water lines had worn off or had otherwise disappeared.

What is that old saying about eternal vigilance?

GOOD DESIGN + EQUIPMENT + CONSTRUCTION = *the best in treatment!*

Because

1 *LOW COST* Overall outlays are generally lower, in the combination of initial and operating costs.

2 *EASY TO OPERATE* Any intelligent man, willing to learn how to perform a few simple tests, can run your plant.

3 *OPERATE AUTOMATICALLY* Can be equipped with automatic controls so that in all ordinary circumstances they operate efficiently.

4 *LONG LIFE* Trickling filters are built for long life, to outlive the bonds you issue to pay for them.

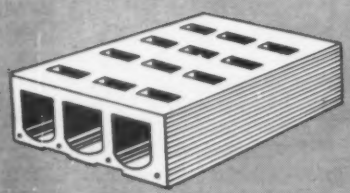
5 *GOOD RESULTS* Top-notch efficiency — say 20 ppm BOD — day after day. Your consulting engineer can design for quality of effluent you need.

6 *OVERLOAD NO PROBLEM* Take temporary shock loads in their stride. A new industry in your community offers no new problem here.

Symbol of Good Treatment

USFI

TRICKLING FILTER



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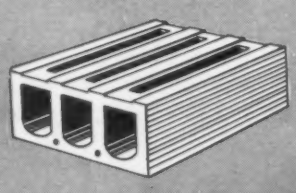
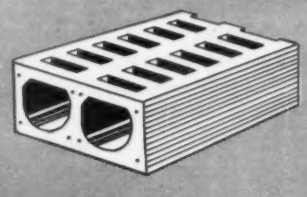
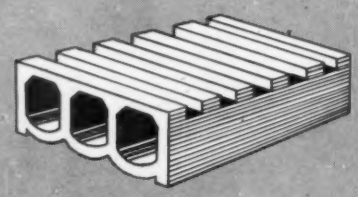
902 Walnut St.
Kansas City 6, Mo.



POMONA
Pomona Terra-Cotta Co.
Pomona, N. Car.

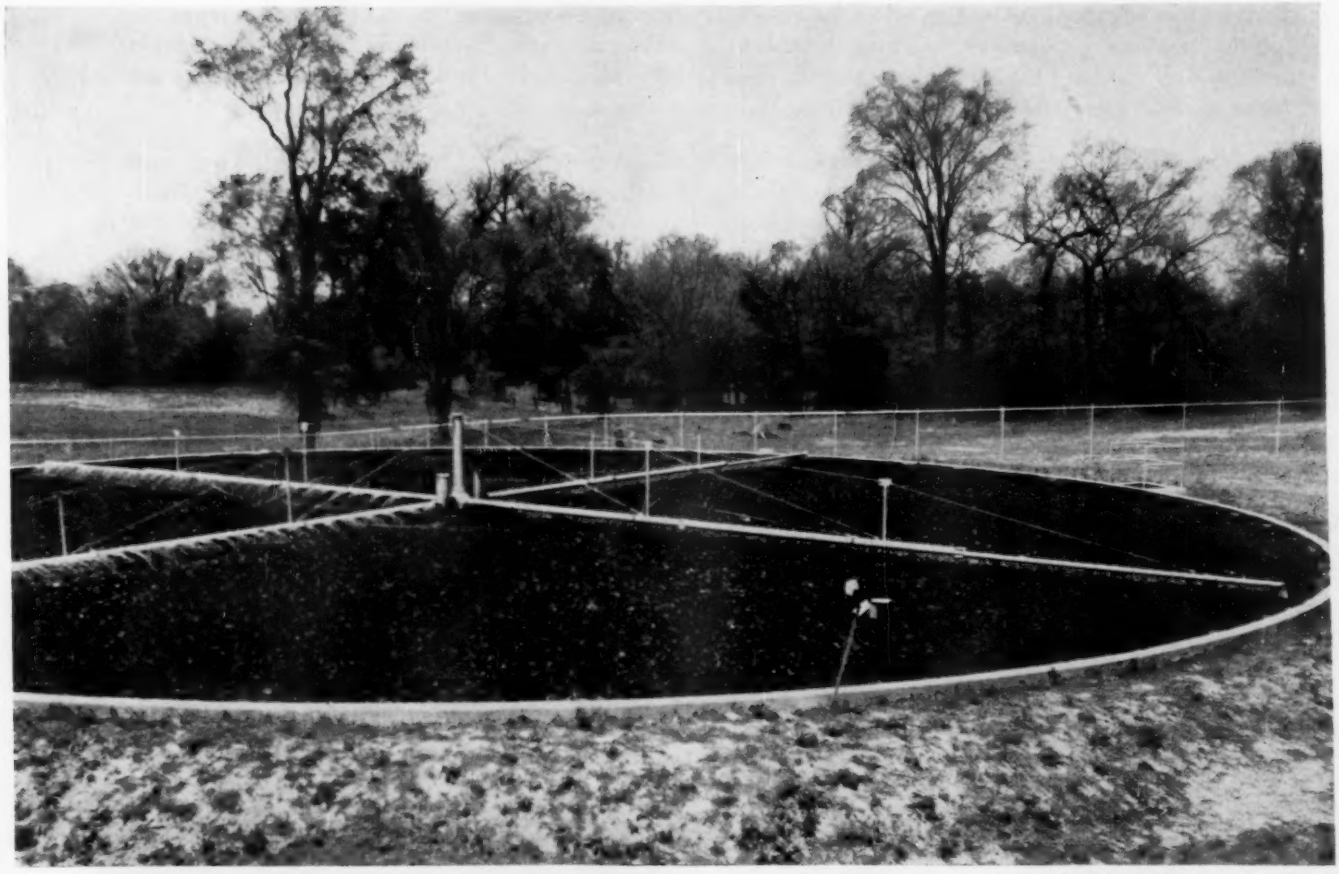


ARMCRE
Ayer-McCarel Clay Co., Inc.
Brazil, Ind.



TRANSLOT
Texas Vitrified Pipe Co.
Mineral Wells, Texas.

you can be sure it's the best if you use a trickling filter with TFFI underdrain blocks specified

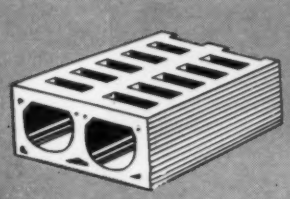


Farmington, Mo., sewage disposal plant. Walker Process Rotoseal Rotary Distributor. Consulting Engineer: Charles A. Haskins, Kansas City, Mo. Contractor: Lippert Bros. Inc., Oklahoma City, Okla.

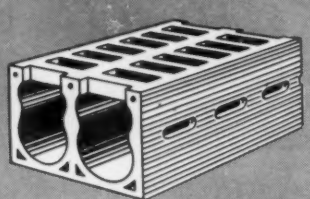
SPECIFICATIONS FOR UNDERDRAINS

Are contained in pages 37 and 38 of the TRICKLING FILTER HANDBOOK, third edition, under "Standard Specifications for Vitrified Clay Filter Blocks for Trickling Filters." Available from TFFI members.

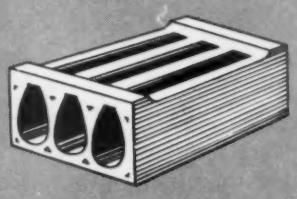
FLOOR INSTITUTE



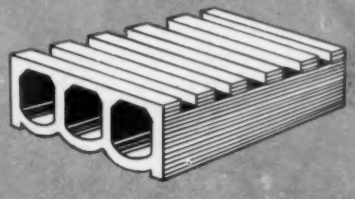
BOSCO
Bowerston Shale Co
Bowerston, Ohio



ACCELO HI-CAP*
Ayer-McCarel Clay Co., Inc.
Brazil, Ind.



NATCO
Natco Corporation
327 Fifth Ave.
Pittsburgh 22, Pa.



TRANSLOT
Cannelton Sewer Pipe Co.
Cannelton, Ind.

*Reg. Trade-Mark of Infilco Inc.

Something has been done about

This new revolutionary method for handling huge quantities of rubbish on long hauls offers tremendous savings.

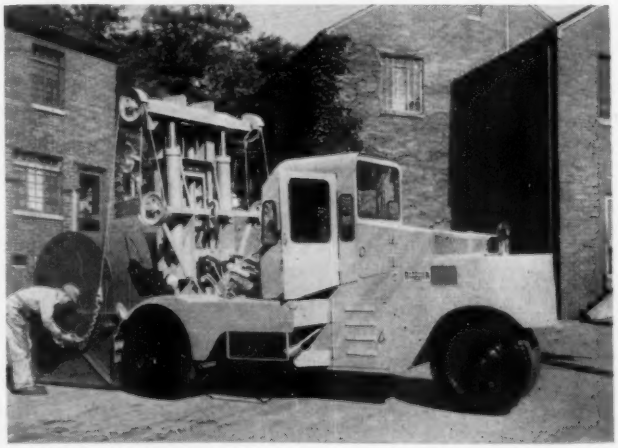
With this announcement we introduce the new Dempster-Dumpster GRD 304, designed to handle large Dempster-Dumpster Containers in combination with a big capacity trailer. It may be the solution to your problem of handling trash and rubbish over the long haul from points of accumulation to the dump. Here is how it works:

1. You replace inadequate, unsanitary and costly conventional trash cans, barrels, etc. in heavy rubbish production districts such as housing areas with big Dempster-Dumpster Detachable Containers. These containers range up to several times the capacity of the average dump truck body. (In one large housing area 18 Dempster-Dumpster Containers are now doing the job that formerly required 440 conventional cans.) Containers have self-latching doors opened by the tenants for depositing refuse, then close, sealing up the trash . . . eliminating unsanitary conditions, fire hazards, rats and scattered trash by winds and scavengers.

2. On schedule, this fast-moving new Dempster-Dumpster and a 40 to 50 cu. yd. trailer truck, with or without compaction, serve the containers. With its hydraulic tricycle steering, fingertip control and short overall length, this Dempster-Dumpster features quick and easy maneuverability in handling the big containers, one after another. Only two men—the Dempster-Dumpster operator and the trailer-truck driver—are required for the entire operation. The Dempster-Dumpster picks up each container, moves it to trailer and dumps the waste materials. The trash and rubbish from one to several housing areas can be loaded into one big trailer.

This new system offers a great opportunity for low cost, sanitary rubbish collection. It enables you to eliminate trucks standing idle, eliminate loading crews and costly re-handling of trash and rubbish. Write us for complete information today! Manufactured exclusively by Dempster Brothers, Inc.

The photo at right shows the GRD 304 operator attaching lifting chains to a loaded 8 cu. yd. Apartment Type Container in a large housing area. The container is then hoisted hydraulically to carrying position, as shown above. Note the trailer near-by in background. The load is then placed in high position for dumping rubbish in trailer as shown in large photo at right. Several containers will be serviced in this same manner before trailer proceeds to another convenient loading point.



DEMPSTER DUMPSTER SYSTEM

DEMPSTER BROTHERS

*Reg. Trade-Mark of Infilco Inc.

the Long Hauls of Trash and Rubbish

THE DEMPSTER-DUMPSTER SYSTEM has proved its ability to: Cut costs of equipment and operation . . . eliminate standing idle time and eliminate re-handling of trash and rubbish — each Dempster-Dumpster Container is pre-loaded where rubbish generates . . . increase efficiency, sanitation and good housekeeping!

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THE MEMBERSHIP OF A C.I.P. Century Club

96%

OF ALL 6-INCH AND LARGER CAST IRON WATER MAINS EVER LAID IN 25 REPRESENTATIVE CITIES ARE STILL IN SERVICE.

Based on the findings of a survey conducted by leading water works engineers.

CAST IRON PIPE

It's a fact... our handy Readers' Service card is the way to get new catalogs.

DISTINGUISHED CLUB... now has 67 Members!

The Cast Iron Pipe Century Club is probably the most unusual club in the world. Membership is limited to municipal, or privately-owned, water and gas supply systems having cast iron mains in service for a century or more. Although the Club is formally constituted, there are no dues, no regular meetings, and no obligations other than to inform the Recording Secretary if and when the qualifying water or gas main is taken out of service, or, sold for re-use.

In spite of the unique requirements for membership, the Club roster grows, year by year, from 18 in 1947 to 67 in 1954. Members comprise 35 *water* and 32 *gas* utilities, in cities large and small, from the Pacific to the Atlantic, from Canada to the Gulf.

If your records show a cast iron main in service, laid a century or more ago, the Club invites you to send for a handsome framed Certificate of Honorary Membership. Address Thomas F. Wolfe, Recording Secretary, Cast Iron Pipe Century Club, Peoples Gas Bldg., Chicago 3, Illinois.

CLUB ROSTER

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Albany, New York
ALEXANDRIA WATER COMPANY
Alexandria, Virginia
BUREAU OF WATER, DEPT. OF PUBLIC WORKS
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Baltimore, Maryland
PUBLIC WORKS DEPT., WATER DIVISION
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UP FRONT FOR ADEQUATE ROADS

by
LEO J. RITTER, JR.

Hassle in Illinois—Late in November, Governor Stratton of Illinois announced plans to market 390 million dollars of revenue bonds shortly after January 1, in order to finance the construction of 191 miles of toll highways. Three principal toll facilities are included in the program. One is the Tri-State Turnpike, which will begin at the Indiana line, go around Chicago (west of the city), thence north to the Wisconsin line, heading in the general direction of Milwaukee. A second is a route from the tri-state by-pass northwest to Rockford, then north toward Beloit, Wisconsin. The third is a portion of the East-West Turnpike, from the tri-state route west to Aurora. Man, what a hassle the Toll Road Commission and the Governor stirred up with the announcement! Local interests in the west and north suburbs of Chicago are really up in arms at the time of this writing. The fuss is not so much over the program, but the location of the toll roads. Apparently, local governments were not consulted in any measurable degree when the locations were established; it appeared that the Commission was trying to railroad the plans through without giving local groups a chance to be heard. There will be some time for hearings, but very little, in our opinion. The whole thing thus far has been bad public relations and, unless the situation changes radically before the bonds are sold, is bound to have adverse political effects on the group now in power in the state.

AASHO Test Road — The Chicago Tribune, late in November, announced that plans were being completed by the American Association of State Highway Officials for the construction and operation of an $11-million test road in northern Illinois. The cooperative project will be 6 miles of new, dual-lane location on Route 6, just north of Ottawa. The test is expected to take from 2 to 4 years to complete; 42 of the states have agreed to contribute financially to the project, with additional support coming from the Bureau of Public Roads and private industry. Great things are expected of this undertaking, which has been in the mill for a long time. Both asphalt and concrete pavements will be evaluated under many different weights and kinds of traffic.

Good Suggestions — Our friend, Ed Rodgers of the Alabama Road Builders' Association, made a lot of sense in the things he said at the ARBA National Highway Conference of County Engineers and Officials last fall. In a paper entitled "Contractor-County Engineer Relations", Ed listed the following *Musts For Construction Harmony*:

For Contractors: "(a) Careful pre-bid inspection of the project in order accurately to foresee the construction difficulties which may be encountered. (b) An intelligent contract price based on intelligent cost analysis, plus ample factors for unforeseen contingencies to which is added a fair overhead and profit. (c) Maintenance of experienced, capable, courteous supervisory personnel supported by a well ordered and manned organization (with adequate equipment). (d) A genuine pride in doing good work with or without inspection. (e) Sufficient working capital to maintain an orderly balanced work schedule. (f) An earnest desire to cooperate with workable tolerance of human failures and faults."

For Engineers: "(a) Accurate plans and specifications, with no notes which might have a double meaning. (b) Specifications which require results only with methods and construction details left to the contractor. (c) Accurate and prompt construction staking, and a willingness to bear responsibility for errors. (d) Trained inspectors and engineers who are capable of interpreting the plans and specifications from a practical standpoint, who are

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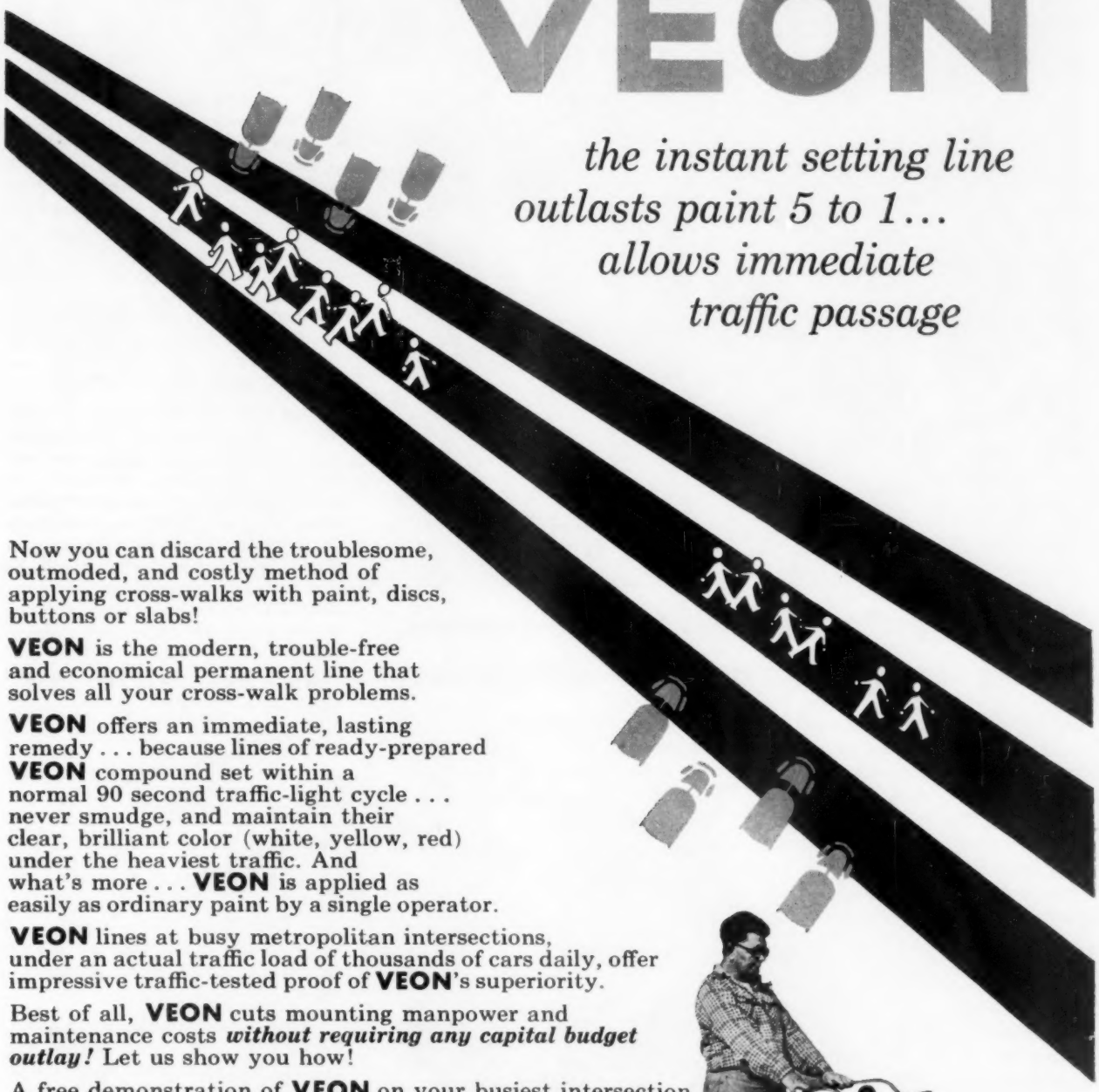

Now you can discard the troublesome, outmoded, and costly method of applying cross-walks with paint, discs, buttons or slabs!

VEON is the modern, trouble-free and economical permanent line that solves all your cross-walk problems.

VEON offers an immediate, lasting remedy . . . because lines of ready-prepared **VEON** compound set within a normal 90 second traffic-light cycle . . . never smudge, and maintain their clear, brilliant color (white, yellow, red) under the heaviest traffic. And what's more . . . **VEON** is applied as easily as ordinary paint by a single operator.

VEON lines at busy metropolitan intersections, under an actual traffic load of thousands of cars daily, offer impressive traffic-tested proof of **VEON**'s superiority.

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A free demonstration of **VEON** on your busiest intersection is yours for the asking. Prove to yourself the superiority of **VEON** under *your* local conditions, as so many traffic engineers have done throughout the country.

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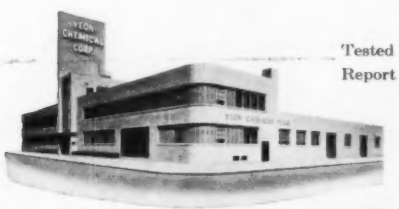

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This East Ohio Gas Company job, the replacement of a main extension, shows why the Cleveland Model 92 "Baby Digger" is so widely used for city digging. The "92" puts the edge of a trench within 17 inches of a parallel wall, loads excess spoil directly into trucks at the curb, and affords the operator full visibility of the whole job.

Its exclusive Cleveland multispeed transmission provides over 30 evenly graduated digging wheel and crawler speed combinations, from 6 inches to 30 feet per minute. Its lower wheel speeds enable it to pick its way safely through the numerous underground obstructions typical of city digging. The three lower of its four wheel speeds provide the correct power applications for digging in even the toughest soils. And its highest speed combinations, of course, assure high daily footage on jobs where high production rates can be used to advantage. It has ample capacity for trench from 10 to 20 inches wide, down to 5 feet deep.

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And does it get around! The "92" hustles safely from job to job . . . at legal limit speeds . . . because it's so easily portable on the drop-axle, tilt-bed Cleveland T5 Trailer.

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sufficiently experienced to recognize standard construction procedures, and who have authority to act. (e) Quick and fair decisions regarding both minor and major items of the contract with prompt engineering assistance and cooperation. (f) Fair compensation for all work, even though it lies outside the terms of the contract or specifications, at a price acceptable to both parties, before work is done. (g) Firm but practical inspection and control. (h) Prompt payment of both monthly and final estimates with all differences of quantities fully and fairly arbitrated. . . . (i) Prompt final inspection and acceptance without the disheartening task of doing the finishing more than once."

New Gimmick We rather like the idea of the automatic, coin-operated toll gates which are being tried out in New Hampshire. It should be pretty hard to fool this gadget, from what we hear. If the motorist fails to drop in the proper coin(s), a magnetic apparatus sets off a horn which summons police and also activates a hidden camera which takes a picture of the offender's license plate.

Winter Maintenance—Still another publication has been added to the library of useful information about maintenance operations in the winter time. This one is "Winter Maintenance of Roads", which is Technical Bulletin No. 211 of the American Road Builders' Association. It was written by members of an ARBA Committee headed by E. M. Baylard, Superintendent of Highways, Syracuse, New York. It is primarily devoted to ice control measures and contains a lot of good, interesting dope.

Highway Needs Studies — Carl Fritts and Jerry Buckley of the headquarters staff of the Automotive Safety Foundation in Washington were kind enough to send copies of the reports covering their two latest highway needs studies—one in Louisiana and the other in Minnesota. Nice, clean-cut jobs, as usual. There is little question that, in the states where ASF has conducted these studies, the information revealed and compiled has been a powerful factor in highway and street improvement. In fact, the conduct and acceptance of a comprehensive highway needs study in a state has come to be almost synonymous with progressive, enlightened leadership in attacking highway transportation problems.

The Big Track — In November we

LOW COST ASPHALT SURFACE REPAIR AND MAINTENANCE . . . with the *New* LITTLEFORD CLARKMOORE ASPHALT ROAD HEATER-PLANER

Littleford-Clarkmoore Heater-Planer permits low cost resurfacing, speeds up major maintenance and repair work on bituminous highways, roads, streets or airport runways.

- Levels rough sections and removes high road crowns.
- Eliminates corrugations on hills and at stop signs.
- Get's rid of troughs and ruts developed by heavy traffic.
- Planes off top surfaces to prepare for seal coating or resurfacing with plant mix or other bituminous materials.
- Removes fatty sections or slippery places. Roughs bad hills to avoid skidding.
- Provides a level course where settlement of surface makes it necessary to build up.

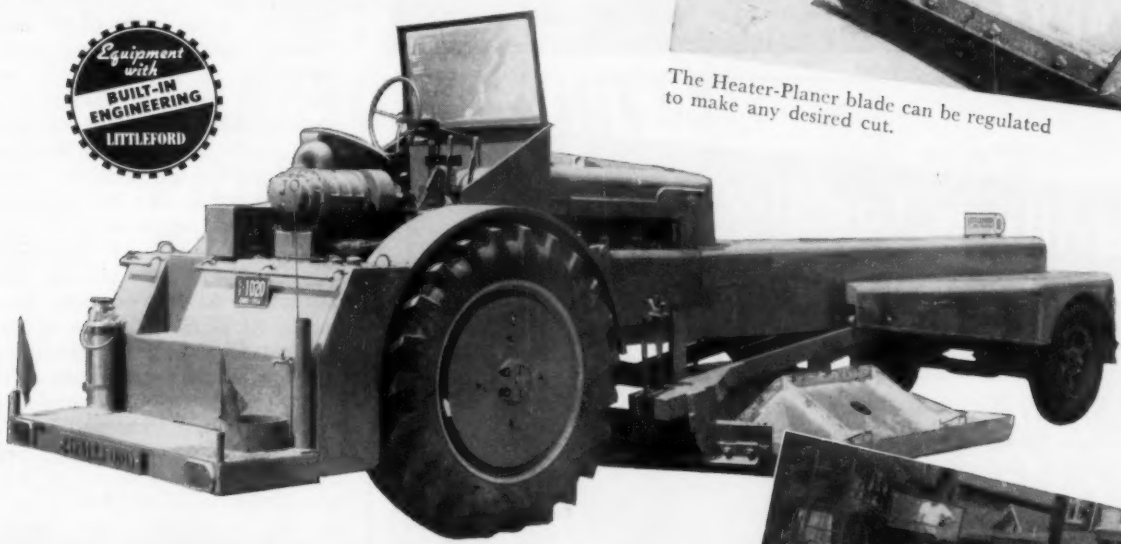
The operation of the Heater-Planer is continuous. It heats and planes as it travels, it's fast and sure. Gives life back to the bituminous surfaces. The reclaimed asphalt can be reused. The Heater-Planer is hydraulically operated, has finger-tip control for operating the blade and surface heater.

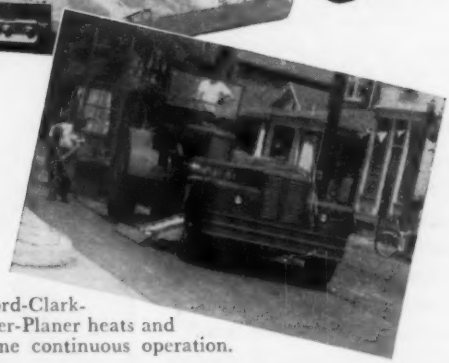
For low-cost table-top smooth riding surfaces, the Heater-Planer is the new modern Road Maintenance Unit.

FOR HEATING AND PLANING BITUMINOUS ROADS, STREETS AND AIRPORT RUNWAYS

The Heater-Planer blade can be regulated to make any desired cut.

Equipment with BUILT-IN ENGINEERING LITTLEFORD





The Littleford-Clarkmoore Heater-Planer heats and planes in one continuous operation.

Littleford-Clarkmoore Heater-Planer planes off and windrows the material so that it can be easily shoveled into a truck. The crew works behind the Heater-Planer, not out in traffic.

BLACK TOP ROAD MAINTENANCE EQUIPMENT — LB — SINCE · 1900

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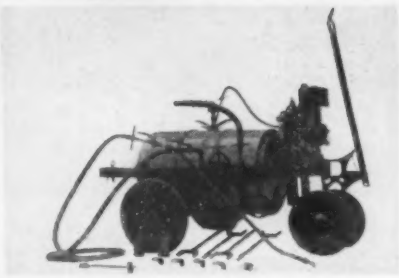

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Prepare now for the road and street repairs you know you'll have to make. The **Tarco** "Direct from the Shipping Drum" Sprayer furnishes you with a **fast, clean, simple** and **economical method of repair.**

Tarco's Power Sprayer applies a wide variety of liquid material "Direct from the Shipping Drum". (1) Bituminous materials like: quick breaking asphalt emulsions, light tars and cut backs. (2) Concrete curing and water-proofing materials. (3) Weed Killers. (4) Insecticides. (5) Cleaning fluid. (6) Oil base paints.

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When it's better to be safe than sorry, engineers investigate underground conditions. And, that's exactly what this Acker TH drill is doing — drilling test holes over a walled-up section of the old Erie Canal preparatory to building an overhead express highway.

For low-cost, dependable sub-soil information, try an Acker on your next job. Several models available with power and type of mounting to best serve your requirements.

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a comlete line of Diamond and Shot Core Drills, Drilling Accessories and Equipment

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had the pleasure of attending a press conference held by the Caterpillar Tractor Company. The occasion was the 50th anniversary of the crawler tractor, which was being celebrated in 1954. The feature attraction was the showing of Caterpillar's new color, sound movie "The Big Track", which tells the story of 50 years of crawler tractors in industry, construction, and agriculture, in peace and war. Narrated by Walter Cronkite in the style of his TV program "You Are There", it is both informative and entertaining. Also, the publication of the company's commemorative volume, "50 Years on Tracks", was announced. This is a 104-page book which should be available through Caterpillar dealers by the time you read this. As has been evident the last few months, competition in the tractor business is getting rougher and rougher. It is evident, too, that Caterpillar has no intention of being left behind. Their new "D9X", larger than the present D8, has been undergoing tests for several months and should be on the market before too much longer.

Around and About — Iowa State College is making considerable progress in its study of methods of treating loess, fine sand, and soft limestone, according to a recent blurb in *Highway Research Abstracts*. Plans for Michigan's first toll road—from Rockwood to Bridgeport (115 miles)—are rapidly nearing fruition; bonds may be marketed by April. Construction is underway on the 8.2-mile Newark Bay-Hudson County Extension of the Jersey Turnpike. At last—a new 31-mile section of U. S. 90 has been opened between Ocean Springs, Mississippi, and the Alabama state line. Glued laminated timber girders and a composite deck are combined in a new timber bridge near Haney, British Columbia; it is believed to be the first structure of its kind. A unique opening ceremony was used to mark the completion of an expressway near Arcata, California, last summer—instead of snipping a ribbon, a professional logger sawed through a large redwood log.

Just Visiting — Enjoyed a recent visit to the Research and Development Laboratories of the Portland Cement Association in Skokie, Illinois. They have a fine set-up; one to make any laboratory man choke up with envy—all the latest analytical and measuring equipment, much of it of the recording type. Earl Felt and Bert Colley were kind enough to squire me around.

The Washington, D.C. Suburban Sanitary Commission is filling in an old gravel pit on this sanitary landfill operation near Hyattsville, Md. The 29,900-lb HD-9G Tractor Shovel shown here is spreading and compacting refuse on the slopes. Cover material for this job is carried from 75 to 100 ft in the HD-9G's two-cu-yd bucket.

TRACTOR SHOVELS PROVE IDEAL MACHINES FOR SANITARY LANDFILL WORK

Allis-Chalmers Tractor Shovels are made to order for the sanitary landfill system of garbage and refuse disposal. Any one of the four different sizes — one, two, three and four-yard capacities — can do the complete job . . . excavate trenches, spread and compact refuse, apply an even cover of dirt fill.

Allis-Chalmers Tractor Shovels are more than just standard tractors equipped with front-end loaders. They are designed and built as complete units to give the best service possible. Many features like these add to their work capacity: all-steel, box A-frame that carries heavy working strains; extra long tracks and truck frames that give better balance for shovel work; 1,000-hour lubrication intervals for truck wheels, idlers and support rollers that eliminate daily maintenance of these parts; simple shift pattern that allows faster work cycles; unit construction for less down time while servicing. For added versatility, there are attachments that can be quickly interchanged with the bucket to keep the tractor busy on other jobs all year long.

★ ★ ★

See the complete line of Tractor Shovels and bulldozers at your Allis-Chalmers dealer, or write for booklet "Sanitary Landfill, An Important Community Benefit."

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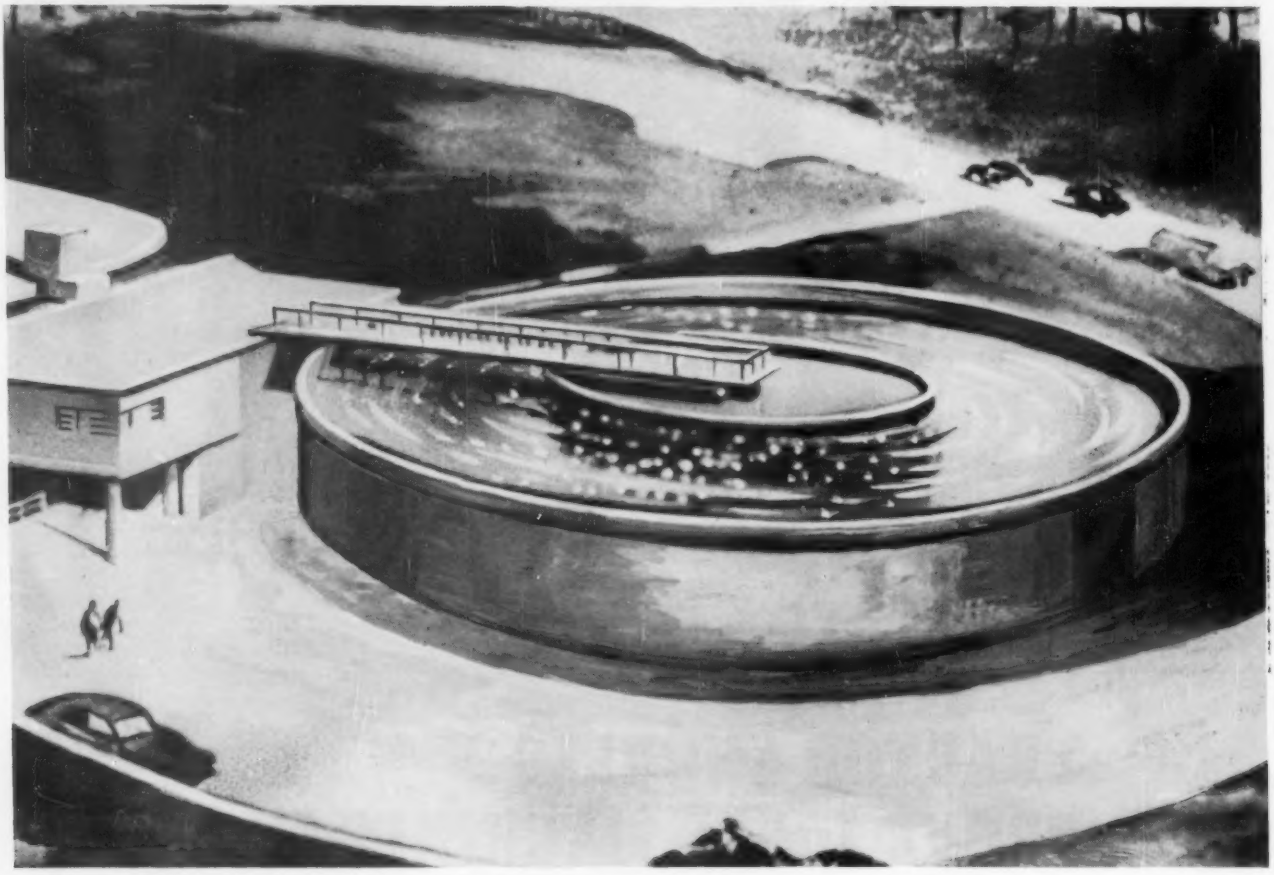

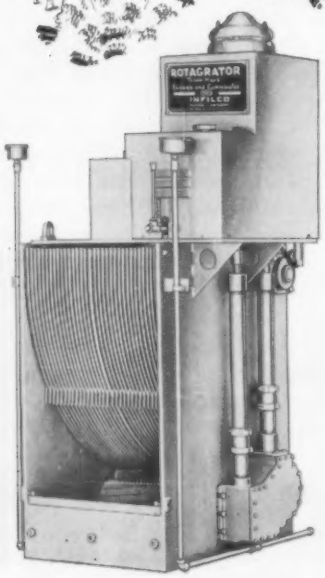

The "AERO-ACCELATOR" treatment units provide high rate sewage treatment (overall BOD reduction better than 90%) at *low cost*. Embodying the latest concepts of activated sludge processing and solids separation, this compact unit requires a detention time of only 4 hours at average flow for complete secondary treatment. This means important savings for any community or institution, regardless of plant capacity.

If you are planning a sewage plant, see your consulting engineer or write INFILCO regarding the economical "AERO-ACCELATOR" treatment unit.

NEW ROTAGRATOR (Trade-Mark) screen and comminutor

A revolutionary development for screening and comminuting *all* coarse sewage material without rejection or removal from the flow. Reduced head loss, straight-channel installation and low power requirement. Eliminates odor and handling nuisances.

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The one company offering engineered equipment for all types of water and waste processing—coagulation, precipitation, sedimentation, flotation, filtration, ion exchange and biological treatment.

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Model 363 shown with car unloader. Lengths to 35 feet. Capacities to 200 tons per hour. Swivel wheels for radial stock piling. Wide range of accessories, including screens.

MOVE

MOVE bulk materials the cheapest way.

Model 374 shown with flanged wheel for radial stock piling. Available with steel wheels or pneumatic tires. Lengths to 60 feet. Capacities to 430 tons per hour. Wide range of accessories, including vibrating screens.

MOVE sand, gravel, cement, wet concrete, coal, coke, ashes, chemicals — almost any bulk material.

MOVE with machines that are truly portable — easily moved around the yard, or towed on the highway.

MOVE materials continuously with less horsepower, less labor, less cost.

MOVE today toward greater profit.

Let us show you how Barber-Greene can reduce your costs.

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FACT: Top efficiency—The new 4-FSL-72 fluorescent luminaire has a large one-piece reflector and offset lamp arrangement. No physical obstructions interfere with light distribution.

FACT: Day and night eye appeal—The smooth fiber glass hood and clear plastic cover blend to produce a clean silhouette by day and a comfortable light source at night.

FACT: Easily maintained—Cover opens from either side by releasing 3 spring tension latches permitting speedy relamping and cleaning. Sponge neoprene gasket seals out bugs and moisture. Cover can be easily replaced in frame by removing 4 screws—slide out old cover—slide in new—without further adjustment.

FACT: Extremely durable—rugged fiber glass hood does not require paint. Extruded methylmethacrylate cover will not craze or discolor. Wiring is by duplex circuit so when a lamp fails, only one lamp in a reflector goes out.

4-FSL-72 can be mounted horizontally or at any angle between 20° and 30° for different light distribution patterns.

For more FACTS see *The Man With The Facts*—your Westinghouse representative.

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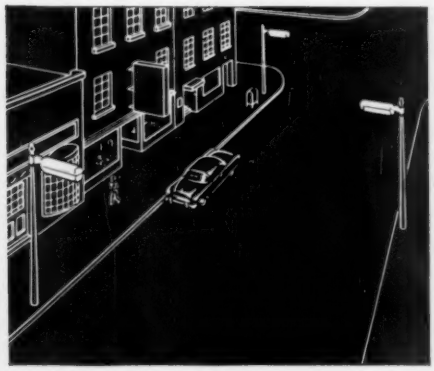
YOU CAN BE SURE...IF IT'S Westinghouse



This exciting new look in street lighting is an attractive addition to any community.

For all the benefits of fluorescent lighting—ask about the new 2-FU-72 for tunnels and underpasses.

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that give a new meaning to "UTILITY"

1. Models to fit 40 different Chevrolet, Ford, International, GMC, Dodge and Studebaker chassis . . . single or dual wheel.
2. For ½ - ¾ - 1 - and 1½-ton trucks.
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4. Exclusive 4-point coil spring body mounting.
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8. Extra-wide doors for easy access.
9. Larger, greater capacity compartments.
10. Embossed door panels for rigidity and appearance.
11. Fully recessed door handles.
12. All doors keyed alike.
13. Tumbler-type locks at no extra cost.

Model 900 D with upper structure

Model 1050 D

14. Full bolt-action locking bar.
15. Weatherproof compartments . . . lap-seal and gutter drain on all doors.
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17. Heavy-duty reinforced 16-gage bulkheads.
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19. 4-way, 12-gage, safety tread non-skid floor.
20. From 25 to 35 sq. feet of floor loading area.
21. Through wheel housings for universal dual wheel application.
22. Reinforced tailgate.
23. Extra strength, bridge-type construction with interlocking lateral and longitudinal reinforcements.
24. Side boxes supported by one-piece cross members, reinforced at mounting holes.
25. Beaded fender panels hinged for easy access to wheels and spring shackles.

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CIVIL ENGINEERING ENROLLMENT

From 8 to 10 percent of each annual crop of high school graduates who enter college go to engineering schools. For some years now, Civil Engineering has not had its share of these admissions, more interest being shown in other branches. Limited student enrollment militates against offering optional sequences and electives. Student demand must be demonstrated to college administrators before budget commitments and allotments will be made for new courses or curricula.

Sound and thorough training is especially important in Civil Engineering—even more than in other branches of engineering. The large corporations absorb into management, research, development and sales a high proportion of other branches of engineering. These corporations are not particularly concerned with the type of undergraduate degree for most of them have training programs for instructing and orienting the young engineers they employ. Though certain branches may be preferred, the programs are filled from the available supply.

The Civil Engineer employer is usually not a large organization and, except for some governmental agencies, in-service training programs are rare. Thus Civil Engineering is more dependent than other branches for an adequate supply of men basically well-trained in civil engineering.

The road to more civil engineers appears to be in better public relations to make known to the public the opportunities in Civil Engineering. Some of this must be done at the national level, but local engineering clubs and sections of national civil engineering societies have an exceptional opportunity to channel information to high school students. Other approaches are possible. Any work done at the high school level will be beneficial; and something must be done if Civil Engineering is

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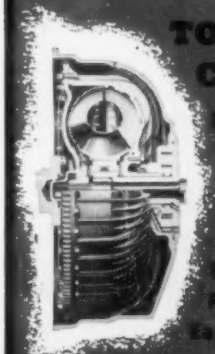

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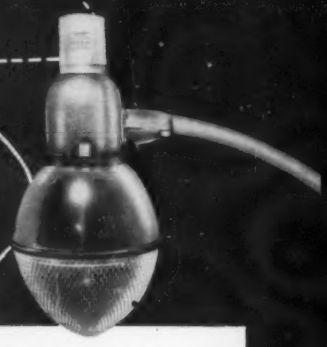

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BOOKS IN BRIEF

"YOUR WESTCHESTER COUNTY GOVERNMENT"

This 28-page, two color booklet describes in an interesting and entertaining manner the various governmental functions of Westchester County, New York. It is profusely illustrated with excellent drawings. Copies may be obtained from Westchester County Government, White Plains, New York.

CALCIUM CHLORIDE FOR ICE CONTROL

This Manual includes recommended procedures for treating and storing abrasives and spreading them for most effective winter maintenance operations. It also contains information on direct application of calcium chloride as well as recommended procedures for mixing with different types of abrasives. Other data consists of charts and tables on skid tests, melting action of treated abrasives, and specifications. Copies free on request to the Calcium Chloride Institute, 909 Ring Bldg., Washington 6, D. C. Ask for Manual IM-1. 30 pages.

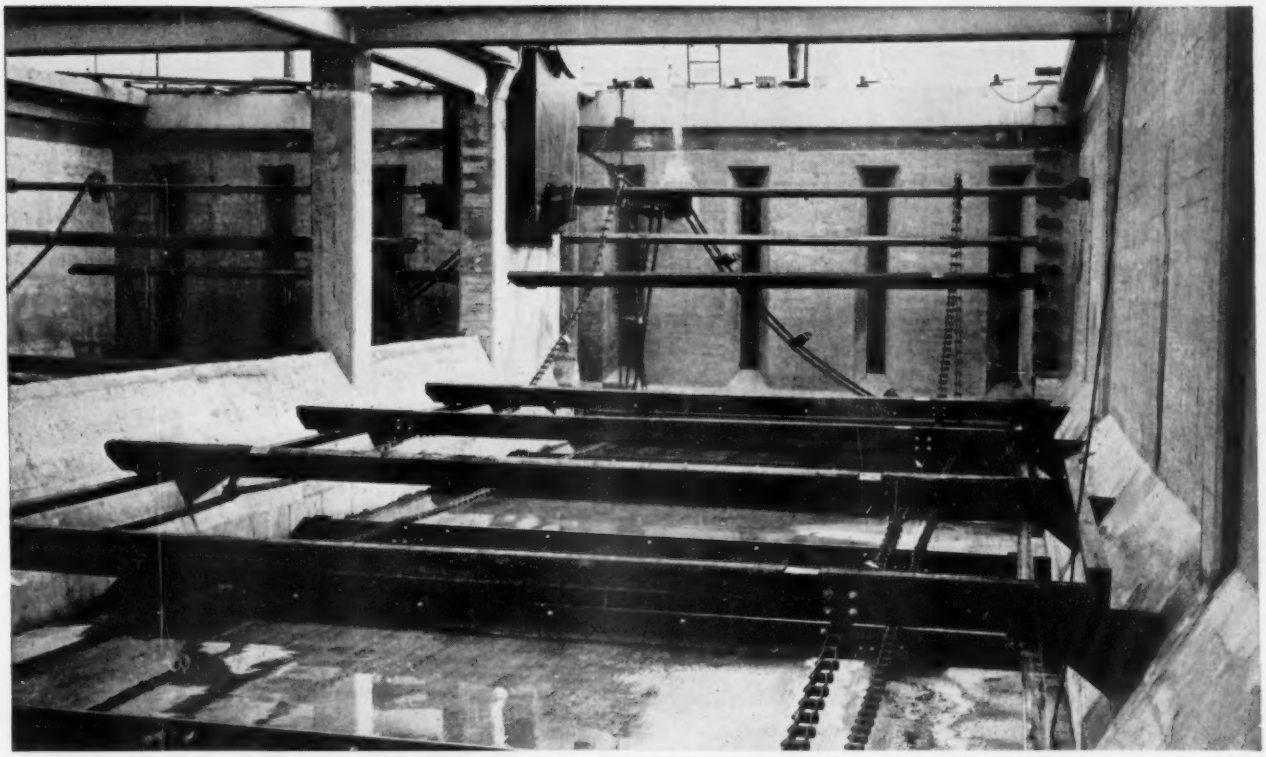
CONTROL OF PLATS & SUBDIVISIONS

Information Bulletin No. 167 of the Association of Washington Cities and the Bureau of Governmental Research of the University of Washington, Seattle 5, Wash., discusses the authority and mandatory requirements and the administrative problems in connection with subdivisions; it then presents a proposed ordinance. This is based on Washington conditions, but contains much valuable information.

WASHO ROAD TEST DESCRIPTION

Part I of Highway Research Board Special Report 18, describes very fully the design, construction and testing procedures of the flexible pavement test road near Malad, Idaho. No conclusions are given and none will be published until 1955. 121 pages, paper bound available from the Highway Research Board, 2101 Constitution Ave., Washington 25, D. C. for $2.25.

Michigan City converts to mechanical flocculation and sludge removal



At Michigan City (Ind.) filtration plant, Link-Belt water treatment equipment has been installed in two existing tanks, and one new tank. Longitudinal and cross collectors can be seen in above photo of settling basins. Straightline mixers are installed in each of three flocculation basins. Link-Belt also furnished all drives (below). Consulting engineer: Boyd E. Phelps, Inc., Michigan City, Ind.

LINK-BELT Straightline Collectors abate lake pollution, reduce chemicals used in water treatment

FOLLOWING the trend by municipal filtration plants to reduce chemical dosage costs by mechanical flocculation and sludge collection, Michigan City, Ind., installed a Link-Belt Straightline mixer and sludge collector system. Immediate results included speed-up of collection and removal... elimination of the cost and inconvenience of periodic draining. And because slowly discharged sludge is easily assimilated by the adjacent lake, pollution is no longer a problem.

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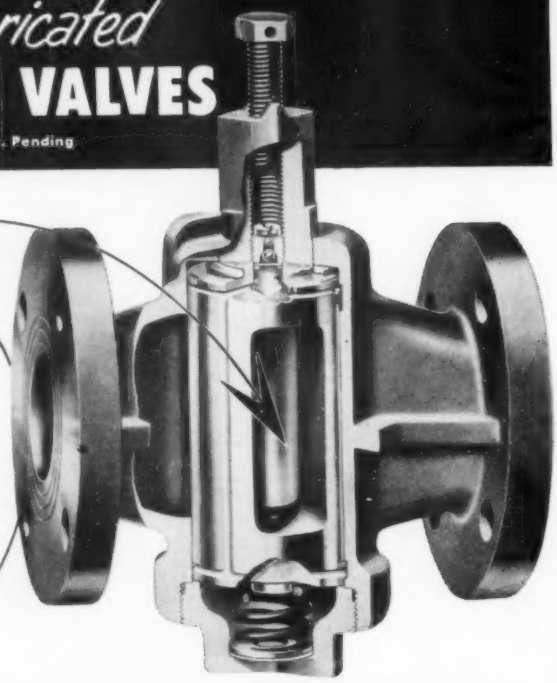

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Ben H. Petty is the so well-known Professor of Highway Engineering at Purdue University that he doesn't need much introduction; but some facts about him may be of interest. He was born in a sod house in Hayes County, Nebr., graduated from Purdue in 1913 with a BSCE degree, and went back to his Alma Mater in 1920 as an instructor in Highway Engineering. In between graduation and return, he was an engineer with the Miami Conservancy District. Since 1933 he has been THE professor of Highway Engineering. He supervises the annual Purdue Road School and assembles and edits the proceedings. He is active in the Highway Research Board and the ARBA. He gets out a monthly High-known Professor of Highway in all, he has authored more than 100 articles on highways.

He was on active duty with the Corps of Engineers at Fort Knox and Camp Campbell from May, 1942 to April, 1945. He belongs to ASCE and is past chairman of the Executive Committee of the Highway Division; past president of the ARBA Educational Division and now nominated for Board of Directors; also a member of NSPE, ASEE, HRB and the Society of Military Engineers; and a member of Tau Beta Pi, Chi Epsilon, Sigma Delta Chi and the Indiana Society of Chicago. His hobbies—reading and writing articles. And, the editor might add, preaching good roads and working for good roads all of the time.

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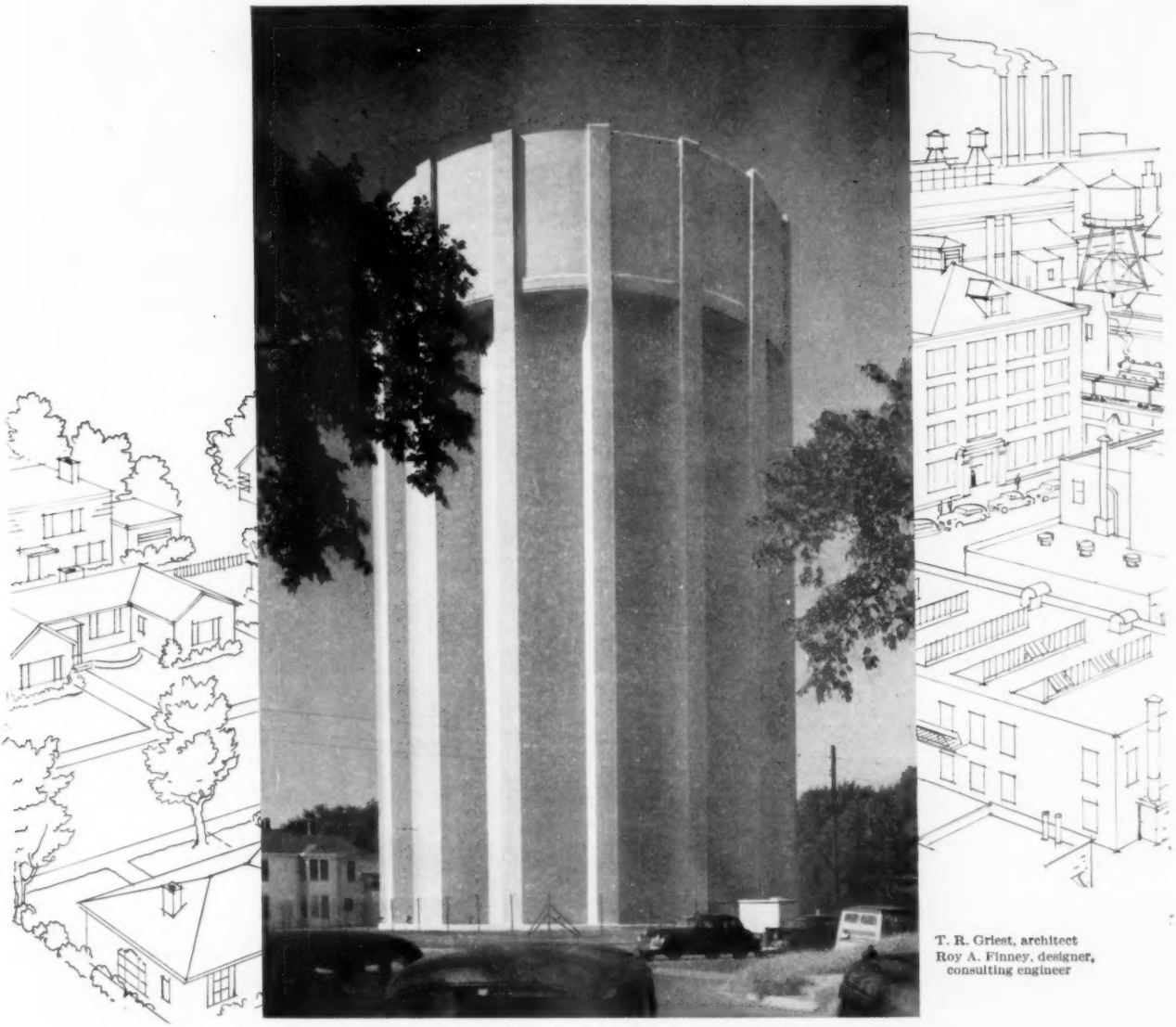

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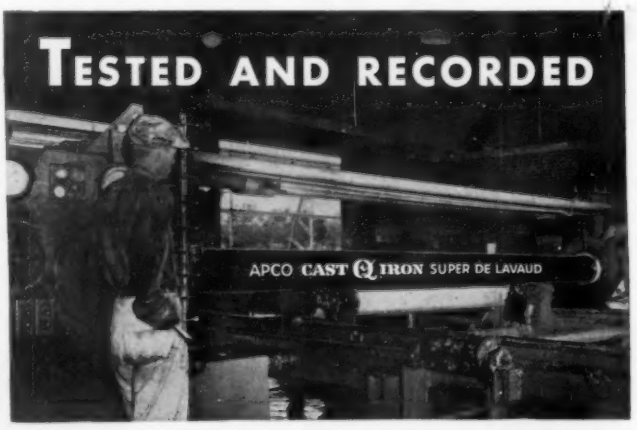

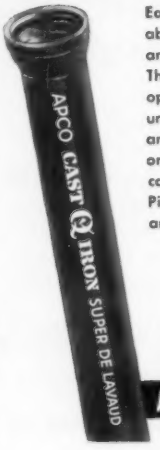

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Dodson's Digest

Making Icy Roads Safe

I was driving through a midwestern state the other day when I ran into some bad weather. Half rain and half sleet, it made the highway slick as owl grease. Hoping for it to let up, I stopped at a roadside hamburger stand for a cup of coffee. Another motorist soon joined me and we got to talking about how dangerous the driving was.

"Icy roads are murder," my new friend said, "I sure wish the highway department could do something about them."

I hadn't intended to talk shop, but that started me off, because I knew that particular state *was* doing something about icy roads. I told my friend how they were using Calcium Chloride, how it melts ice 36 times faster than salt at 1° F., how it makes sand three times as effective for skidproofing, because it anchors the sand in the ice to give roads a safe, sandpaper-like surface.

"That's all very well," he said, interrupting me just as I was getting warmed up. "But what good does it do us. We're sitting here and the road outside is still slippery as . . . "

We both turned to the window in time to see the big yellow highway truck rumble by, spreading sand treated with Calcium Chloride.

My friend grinned at me. "You win," he said, "I talked too soon . . . the coffee's on me! I'll even try some of your Calcium Chloride on my walks at home. Who knows? It might save me from a law suit."

We shook hands, finished our coffee, said goodbye, and drove off on a highway that was now skidproof and safe . . . thanks to an alert highway department and Calcium Chloride!

— L. D. Dodson

P.S. If you would like an illustrated folder on the use of Wyandotte Calcium Chloride for melting or skidproofing icy surfaces, drop me a line. *Dept. CC, Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

Wyandotte CHEMICALS

HEADQUARTERS FOR CALCIUM CHLORIDE

Helpful Data on Water Works Products

49. A completely new catalog covering the entire line of water distribution and service products offered by the Mueller Company, of Decatur Ill., is now available to engineers and water works superintendents. The 328-page catalog features an easy-to-use sectional indexing arrangement to facilitate quick reference to any of the hundreds of products listed. A large section of useful engineering information is included. Check the coupon today.

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American water meters described in Bulletin No. 55 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Get your copy by checking the coupon.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal, control of certain tastes and odors, plus other aids in high quality water production. Check coupon for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

Engineering Facts About Transite Pipe

83. This compilation of Johns-Manville's "Engineering Facts" series presents concise, factual information about Transite's many economic and engineering advantages, and includes informative case histories plus dimensions and data for your files. Write Johns-Manville, Box 290, New York 16, N. Y., or use the handy coupon.

Design Data on Chemical Flocculating Equipment

89. Flash mixers, Straightline mixers, conveyors and elevators for handling chemicals are described in illustrated Bulletin No. 2442 available from Link-Belt Co., Colmar, Pa. Selection tables and diagrams are provided to help you select the equipment best suited to your needs. Check the coupon for your copy.

Methods of Chlorinator Control

98. Chlorinator control methods include manual, semi-automatic, program, rate, fully automatic proportional and split feed control. To assist the chlorinator user and his engineer or technical adviser in the selection of the control method best suited for each requirement, a publication of Wallace & Tiernan, Inc., describes these methods in detail. You can get a copy of Publication TA-1013-C by checking the coupon.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

Quick Review of Measuring and Control Equipment

113. Short descriptions and characteristics of various types of measuring and control equipment for water and sewage applications are provided in 4-page Bulletin 050 prepared by Simplex Valve & Meter Co., 68th and Upland Sts., Philadelphia 42, Pa. Check the coupon.

Makes Underground Pipe Installation Easy

115. One-man operated hydraulic pipe pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts ask for Form E-213, Greenlee Tool Co., Rockford, Ill. Just check the coupon.

Discussion of Ranney Method For Municipal Water Production

116. A very interesting study of municipal and industrial water supply problems and a complete discussion of Ranney Collectors for water production will be found in a 20-page booklet published by Ranney Method Water Supplies, Inc., Box 5419, Columbus 19, Ohio. Water quality, construction methods, costs, performance and other topics are considered. Check the coupon to get your copy.

Pipe Detector Determines Exact Location and Depth

120. Determination of the exact location and depth of buried pipes, valves, service cables and other metallic objects can save costly digging and unnecessary damage. Your work can be speeded when you use the Detectron pipe detector, which features simple operation, shielding to avoid static interference, economical unit construction and a lifetime guarantee. Get full data from Detectron Co., 5528 Vineland Blvd., No. Hollywood, Calif., by using the coupon.

Data on the Ratochlor Chlorine Dispenser

134. Complete descriptive literature on Ratochlor chlorinators which feature corrosion resistance, safety, dependability and direct, visible flow measurement is available from Fischer & Porter Co., Hatboro, Pa. Details of operation, applications and full engineering data are furnished. Write today or check the coupon for latest information.

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from 2½" to 14½" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydrauger Corp., 681 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered.

Engineering Data on Diatomite Filters

139. Get complete data on the Sparkler model SC-J diatomite slurry feed filter for swimming pools from the Sparkler Mfg. Co., Mundelein, Ill. Check the coupon for full information including table of filter sizes and capacities, space required and filter operation.

How Engineers and Contractors Can Get This Comprehensive Water Control Apparatus Catalog

141. A 250-page catalog showng the full scope of Rodney Hunt water control apparatus is now available for distribution to consulting engineers, contractors and others actively engaged in water control construction work. Hundreds of diagrams, detailed descriptions and specifications show all types of sluice gates and related items, and a special section provides helpful engineering data. Send your request on business letterhead or use the coupon, stating your occupation. Rodney Hunt Machine Co., 7 Water St., Orange, Mass.

What You Should Know About Turbine Pumps

167. In a colorful bulletin titled "Water Where You Want It . . . When You Want It" the Johnston Pump Co., Bin "K", Pasadena 8, Calif., gives details on turbine pumps with semi-open or closed impellers; oil or water lubrication; and adaptations for any power source or combination thereof. Get your copy of Bulletin 1015 by checking the coupon.

Pipe Joint Essentials and Couplings for Every Job

168. Superior pipe joints are tight, flexible, simple, strong and economical. Dresser's handsome 34-page bulletin No. 513 shows how these essentials are met and provides layouts for curves, working pressures and a wealth of other data. Be sure to check this bulletin on the coupon. Dresser Mfg. Div., 59 Fisher Ave., Bradford, Pa.

Get This Helpful Data On Valve Boxes

187. Full details on service, roadway and valve boxes, meter boxes, frames and covers are included in Bulletin 2000 issued by Alabama Pipe Co., Anniston, Ala. All standard sizes are listed, together with prices, and instructions are furnished for handling special designs. Check the coupon for your copy.

Those Who Use It...Choose It Again

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Plus These additional features:

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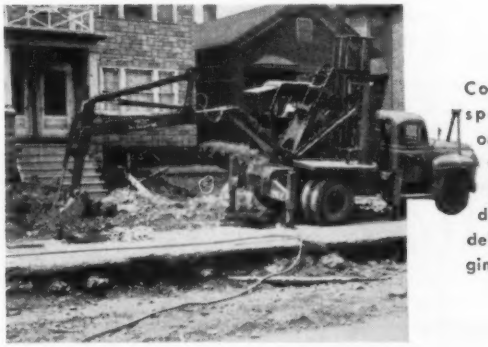

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Locate Mains, Services and Leaks Without Digging

186. An 8-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes, cables, valves, manhole covers, conductive and non-conductive sewer pipes and septic tanks by electronic means. Dry battery operated. Only one man is needed for operation. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif., by checking the coupon.

Assistance in Planning Electrical Systems

189. On every water and sewage plant expansion, modernization or new construction job, you can get valuable assistance in planning the electrical system from Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. Be sure to investigate compact, unitized Westinghouse equipment which conserves building space and simplifies maintenance. Check the coupon for full data.

Engineering Data on Tilting Disc Check Valves

196. The Chapman tilting disc check valve is designed to lift away from the body seat without sliding or wearing; closes without slamming. Operating principles, details of construction, dimensions, recommendations and engineering data are fully covered in 18-page Bulletin No. 30. Get your copy by checking the coupon or write to Chapman Valve Mfg. Co., Indian Orchard, Mass.

Helpful Data On Pipe Tools

230. Toledo drop head ratchet threaders are light, compact, ideally suited for work in tight corners. Three models for ⅛" to ¾": ⅛" to 1¼"; and ½" to 2" pipe all feature quick change of sizes. Get Catalog 12A53 from Toledo Pipe Threading Machine Co., Toledo, Ohio. Check the coupon.

Automatic Cutter Saws Cast Iron Pipe

393. This portable automatic pipe saw, available with either pneumatic or electric drive, makes fast precision cuts in 8-in. to 60-in. cast iron or steel pipe. Features are light weight, minimum clearance required, easy operation even when submerged. Get details from Prescott Tool Co., Inc., Worcester, Mass., by checking the coupon.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in convenient booklets offered with the compliments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the coupon.

Technical Bulletin on Solenoid Operated Valves

288. Full technical data on application, construction, dimensions and specifications of Golden-Anderson Cushioned solenoid operated valves is contained in Bulletin W-7, available from Golden-Anderson Valve Specialty Co., 1232 Ridge Ave., Pittsburgh, Pa. Selected valve patterns are offered in ½ to 2-in. and 2½ to 36-in. sizes. Get all the details; just check the coupon.

Factors to Consider in Elevated Tank Selection

299. Details on the several different types of elevated steel tanks, including capacity ranges, tank dimensions and other factors to be considered in the selection of elevated tanks for modern water storage, plus discussions of new tanks for old towers and foundations are included in Bulletin 101 of the Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. Check coupon for your copy.

Technical Data Offered On Flow Tubes

378. The new short differential producing metering device, the Dall Flow Tube, is fully described in Technical Bulletin 115-L3 issued by Builders-Providence, Inc., 345 Harris Ave., Providence 1, R. I. Sections include installation data, capacity tables and graphs and all pertinent engineering information. Check the coupon today.

Efficient Underdrains for Rapid Sand Filters

239. Be sure you have engineering data on vitrified clay underdrains, efficiently designed for filtering and backwashing. Check the coupon or write F. B. Leopold Co., Inc., Dept. PW, 2413 W. Carlson St., Pittsburgh 4, Pa.

Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the work goes twice as fast. Two models, for pipe up to 2" dia. Get full details by checking the coupon. Trojan Mfg. Co., 1114 Race Dr., Troy, Ohio.

Cleaning Service for Every Type of Pipe Line

302. Flexible Pipe Cleaning Co., operating with specialized equipment and trained crews, is prepared to remove scale, rust and other deposits from pipes for every type of service. For details and estimates furnished without obligation write Flexible Pipe Cleaning Co., Box 167, Los Nietos, Calif. or check the coupon.

Helpful Data on Water Meters

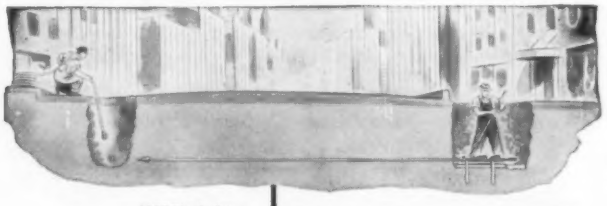
330. It is to the interest of every water works superintendent and engineer to have full data on dependable Badger water meters and related meter products. Complete data on all types of disc, turbine and compound meters, meter test equipment, yokes, strainers and alarm registers are supplied in an attractive binder by Badger Meter Mfg. Co., Milwaukee 45, Wis. Check the coupon for your copy.

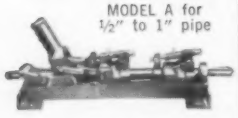
Engineering Data on Equipment for Municipal Water Conditioning

347. For information on the design and operation of many types of water treatment plant equipment, including the Graver Reactivator, pressure filters, iron removal installations, zeolite softening and water conditioning for swimming pools get Bulletin WC-113 from Graver Water Conditioning Co., 216 West 14th St., New York 11, N. Y. Check the coupon.

Trojan Pipe Puller & Pusher

installs or renews pipe under pavement *in half the time* required by any other machine!





Exclusive continuous action, which eliminates all resetting of grip, does the trick!

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Model A needs only 5' trench. One man can easily install the average service. 15 tons of pushing pressure possible.

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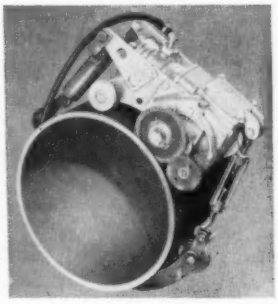
PORTABLE AUTOMATIC PIPE CUTTERS

with Pneumatic or Electric Drive

for Cast Iron and Steel Pipe from 6" to 60" diameter



- Weight: only 145 lbs.
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- Set up time: 5-10 min. by 1 or 2 unskilled men.
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- Cuts 8" pipe in 5 min.—24" in 18 min.
- Also available: "V" cutter for welded steel pipe.

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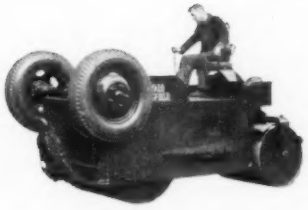

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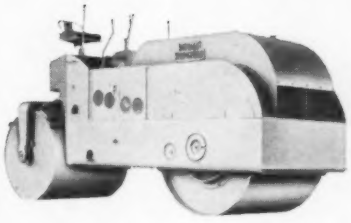
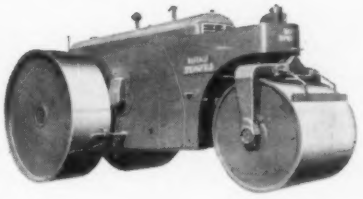
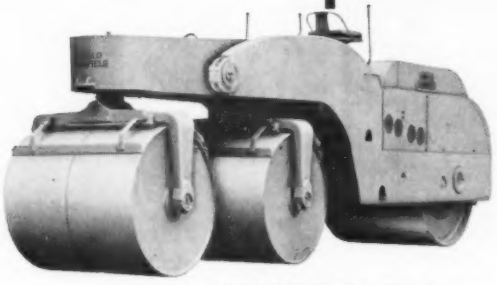


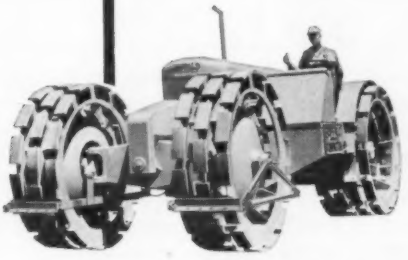
Two Axle Tandem Rollers



Variable Weight 3-Wheel Rollers



KX-3 Axle Tandem Roller



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Buffalo-Springfield equipment is playing a *major role* in the network of super highways now being built across the country. Contractors everywhere depend on Buffalo-Springfield Road Rollers for faster, superior compaction. Each Buffalo-Springfield roller has design features that *increase* work capacity, cut *operating* and *maintenance* costs.

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The job: Break up 3" of asphalt and 8" of concrete with air tools, then dig bellholes 5 feet deep for repairs to underground conduit. The location: A busy street, where traffic congestion must be kept to a minimum, repairs made, and the street re-paved for traffic to resume as soon as possible.

The solution: A Sherman Power Digger. Its actuated shovel action made it possible to dig an under-cut bellhole to the required depth with a small surface opening, thus keeping later street re-surfacing cost to a minimum. The tractor-mounted digger traveled to the site under its own power, dug at a fraction of the cost of hand labor, and saved considerable time by loading spoil directly into trucks from the excavation.

If you now excavate by hand or with machines too clumsy for jobs like this, investigate the Sherman Power Digger. It's compact, flexible, fast, easy to operate. It costs little to buy, less to maintain, quickly pays for itself. Write today for Bulletin No. N-58.

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SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete, easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 40-page booklet issued by Flexible Sales Corp., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included. Check the coupon for your copy of this helpful handbook.

High Rate Filters For Sewage Treatment

74. Accelerated biological oxidation in treatment of sewage and other organic wastes is a feature of Infilco's Accelo Filter system. Bulletin 6200 explains the direct recirculation principle, shows plant layouts, and gives performance data. For your copy write Infilco Inc., Box 5033, Tucson, Ariz., or check handy coupon.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers. Requests for this valuable booklet must be made on business letterhead.

Inexpensive Ditcher Handles Heavy Digging

91. The Shawnee Scout Ditcher, a new heavier model for extensive digging has been added to the Shawnee line of ditchers and dozers. All models are designed to handle ditching and backfilling operations quickly, efficiently and at low cost. Full information on this equipment will be sent by Shawnee Mfg. Co., 1947 N. Topeka, Topeka, Kansas. Just check the coupon.

Design Data for the Spiraflo Clarifier

124. Be sure to investigate the advantages of the Spiraflo clarifier for sewage treatment. Full engineering data, description of the unit, test results and specifications are offered in 24-page Bulletin 122 by Lakeside Engineering Corp., 222 W. Adams St., Chicago, Ill. Check the coupon today.

Sewer Capacity Speedily Restored By "Reboring" Service

178. An attractive brochure offered by National Power Rodding Corp. describes their mobile unit with specially designed power rodding drive and central mechanism that gets on the job fast; rebores clogged sewers and drains cleanly and safely without impeding traffic or disturbing property. Check the coupon or write National Power Rodding Corp., 201 N. Wells St., Chicago 44, Ill.

Non-Clogging Vertical Wet-Pit Pump Described

182. Full engineering data on Worthington "Freeflo" wet-pit pumps with non-clogging impellers capable of passing solids and stringy material are included in Bulletin W-317-B12. Check these pumps for sump, sewage and drainage service. Bulletin available from Worthington Corp., Harrison, N. J. Just use the coupon.

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OMAHA, NEBRASKA
To avoid serious traffic jams while constructing its 48" pump discharge line through busy Omaha, Metropolitan Utilities District engineers constructed a 200-foot tunnel 25 feet below ground level. The half-mile Dresser-Coupled steel line will deliver water to a new reservoir.

Busy Traffic Scarcely Knew It

OMAHA AVOIDS TIE-UPS LAYING DRESSER-COUPLED STEEL LINE THROUGH TUNNEL

Like Omaha, growing cities everywhere are thoroughly familiar with the many advantages of steel water pipe joined with Dresser Couplings.

This modern type of construction provides city engineers and contractors with a virtually "packaged pipe line"—easy to lay out and assemble, readily adaptable to job conditions, predictable as to cost.

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In addition to assuring low over-all installed cost, a Dresser-Coupled steel water line sustains high carrying capacity, "lives in the ground" without maintenance . . . results in *delivering water cheaper.*

✓ ***BE SURE*** **you get the best line at the best price. Always put steel pipe and Dresser Couplings in your specifications.**

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Dresser Manufacturing Division, 69 Fisher Ave., Bradford, Pa. (One of the Dresser Industries). Warehouses: 1121 Rothwell St.,Houston;101 S. Airport Blvd., S. San Francisco. Sales Offices also in: New York, Philadelphia, Chicago, Toronto.

Packaged Sewage Treatment—Just Right for Small Places

36. "Packaged" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 622 Diversey Pkwy., Chicago 14, Ill.

Helpful Data on Bermico Pipe Fittings

280. Data are now available on fittings for use with Bermico sewer pipe and perforated pipe—T's, Y's and bends to make complete root-proof, water tight, corrosion-resistant Bermico pipe systems. Get full information by checking the coupon. Brown Co., 150 Causeway St., Boston, Mass.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy coupon or write Combustion Engineering Inc., Raymond Div., 200 Madison Ave., New York 16, N. Y.

Have You Heard About Bionetics For Sewage Treatment?

350. Bionetics, a dry staple powder of groups of living organisms preserved with enzyme systems, is available in several types to improve and accelerate the biological processes performed at sewage treatment plants. Get full data from Reliance Chemicals Corp., Box 6724, Houston 5, Texas. Just check the handy coupon.

Engineering Data on Lubricated Plug Valves

355. Full information on Homestead lubricated plug valves in full-port and venturi types, sizes up to 14", and with a choice of self-seald two-piece plug or one-piece plug designs. Engineering information includes principal dimensions, types of control, metals, lubricants, etc. For your copy write Homestead Valve Mfg. Co., Coraopolis, Pa., or check the coupon.

Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 52-page Catalog 833-A. Detailed information is provided on bar screens, grinders, grit collectors, "Jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use coupon or write Jeffrey Mfg. Co., 947 N. 4th St., Columbus 16, Ohio.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the coupon.

Informative Bulletin Discusses Versatile Sewer Structures

334. Choice of the right type of sewer structure involves consideration of installed economy, long life, easy handling and fast assembly. For a helpful discussion of these important factors and a convenient table for selection of the most suitable type of structure get Folder CMS 6154 by checking the coupon. Armco Drainage & Metal Products, Inc., Middletown, Ohio.

Are You Ready Now To Make Main Repairs?

214. Broken water mains can quickly be repaired when you have "Skinner-Seal" Split Coupling Clamps on hand. Leaky bell and spigot joints are made lastingly tight with Skinner-Seal Bell Joint Clamps. Get Skinner Catalog 41 now—this handsome 40-page book shows how to make every type of pipe repair and covers a complete line of clamps to do the job quickly and easily. Just check the handy coupon for your copy. M. B. Skinner & Co., So. Bend 21, Ind.

STREETS AND HIGHWAYS

Handbook Covers All Soil Test Apparatus

24. Over 800 items of apparatus for engineering tests of soils, concrete and bituminous materials are described and illustrated in a new 72-page catalog published by Soiltest, Inc., 4520 W. North Ave., Chicago 39, Ill. All standard apparatus for field and laboratory engineering tests of soils are included. Get Catalog 53 by checking the coupon.

Levels Sidewalks and Curbs Quickly and Easily

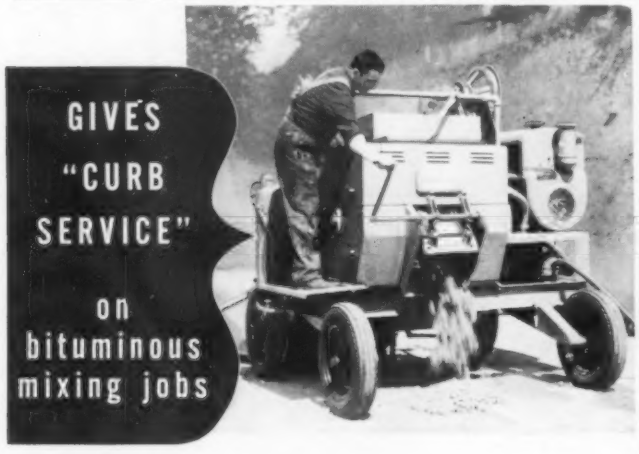
29. How the Mud-Jack Method for raising concrete curb, gutter, walks and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 16, Wis. Check the coupon.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 99H Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision sideshift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Co., Aurora, Ill.

Cut Resurfacing Costs With Manhole Adapters

137. There is a WB "Manhole Adapter" to fit every street opening and for varying elevations to suit your resurfacing job. Be sure to check this way to maintain structural strength, reduce traffic interference and save time and labor. Get full data from A. Reed Wilson Co., 1320 McGee St., Kansas City 6, Mo. Check the coupon.



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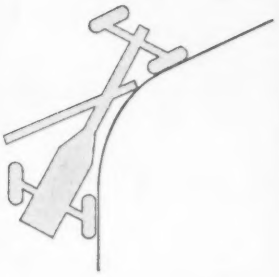

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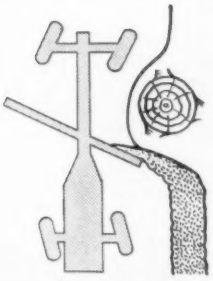

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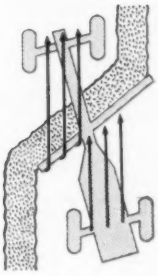

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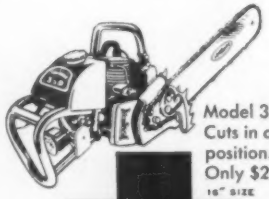

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What You Should Know About Concrete Culvert Construction

61. An excellent reference book published by the Portland Cement Association, 33 West Grand Ave., Chicago 10, Ill. presents a discussion of culverts and conduits from the viewpoint of the engineer who must design them. Fundamental considerations; practical methods by which economical drainage structures may be chosen, properly located and correctly designed; procedures which permit shortcut design without extended analysis; and illustrative examples are included in this helpful publication. Write to PCA or check the coupon for your copy.

Black-Top Paver Offers Many Advantages

150. The flexible Adnun Black Top Paver lays any asphalt mix, hot or cold, in widths from 6 ft. to 13 ft. Careful design lowers operating cost and cuts maintenance. Attachments spread stone, cinders or slag. Get full data on this machine by checking coupon. The Foote Co., 1954 State St., Nunda, N. Y.

Versatile Maintainer Has Year 'Round Usefulness

151. The sturdy Huber Maintainer will work for you the year 'round on maintenance jobs, berm leveling, road planning, bull-dozing, snow plowing, brooming, mowing shoulders and as a patch roller. Good ideas on how to do all these jobs in Bulletin No. M-138. Write Huber-Warco Co., Dept. PW, Marion, Ohio.

End Manhole Rattle The Easy Way

184. It's easy to safeguard manholes and end annoying rattles by using Tapax, a wear-resisting, resilient manhole cushion available in convenient 100-ft. reels from Joseph G. Pollard Co., Inc., New Hyde Park, N. Y. Full details in Bulletin 14. Check the coupon.

The Bros Line of Road Machinery

289. An illustrated folder describing the Bros line of road machinery is available from Wm. Bros Boiler & Manufacturing Co., Minneapolis 14, Minn. Full descriptions of Bituminizer distributors, Spraymatic spray bars, several types of compacting equipment and other units are included. Check the coupon.

Use Hot Patch Material On All Maintenance Jobs

297. With the Barber-Greene Mixall you can get hot patch material wherever and whenever you need it for all maintenance jobs. Send for new 8-page bulletin that gives full information on this small, highly portable unit that turns out all types of bituminous patch material in any quantity you need. Write Barber-Greene Co., Aurora, Ill., or use the coupon.

Fast, Safe Brush Cutting In Hard to Reach Places

301. The light weight, power driven brush cutting attachment which is operated by standard models of the Lombard chain saw provides a tool with great economy on land clearing operations. Initial investment is far less than separate chain saw and brush cutting machines. For literature and full description check the coupon. Lombard, 65 Main St., Ashland, Mass.

Hot or Cold Patching Mixtures Prepared on the Job

304. By preparing your patching mixtures, hot or cold, right on the job, you can use them immediately with a minimum of handling. Get full data on the McConnaughay Model HTD "Multi-Pug" Asphalt Mixer for fast, easy and economical preparation of patch materials. Write K. E. McConnaughay, Layfette, Ind. or use the coupon.

A Helpful Booklet For Those Who Build and Maintain Roads

310. "Governmental Graders," a booklet published especially for the 18,000 governmental agencies with jurisdiction over local-rural roads tells how the three sizes of "Cat" motor graders do the job on road building and maintenance programs. Of particular interest is a table of repair costs compiled from public records. Get your copy from the Caterpillar Tractor Co., Peoria 8, Ill., or by checking the coupon.

What A Road Roller Should Give You

325. Many engineering design features that make Buffalo-Springfield rollers the answer to your needs are described in an attractive bulletin covering the C-Model Two-Axle Tandems of Buffalo-Springfield Roller Co., Springfield, Ohio. Included are details on open gridwork for better operator visibility, increased ground clearance and bevel gear drive. Investigate these and many other features listed in Form No. S 61-53. Check the coupon.

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STREET LIGHTING AND TRAFFIC CONTROL

Investigate These Street Lighting Standards

54. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards, brackets and mast arms by using the handy coupon. Check these strong, well designed, inexpensive steel standards for practical street and highway lighting. Handsome 26-page folder includes data sheets on floodlighting and area lighting applications. Kerrigan Iron Works, 1033 Herman St., Nashville, Tenn.

Engineering Data on Aluminum Lighting Standards

256. Latest designs and applications of all-aluminum, seamless, tapered lighting standards, traffic signal posts and elliptical lighting brackets plus detail drawings and mechanical specifications are provided in a comprehensive 16-page bulletin issued by Pfaff & Kendall, 84 Foundry St, Newark, N. J.

New Reflectorized Sign Faces Refurbish Old Traffic Signs

292. Get complete details on new "EZ-On" traffic signs faces ready for immediate shipments. Reflectorized faces cost only a fraction as much as new signs and are easily attached to existing traffic signs. Use the coupon for data today. Grace Sign & Mfg. Co., St. Louis 18, Mo.

Traffic-Actuated Controls For Every Intersection Problem

392. Traffic control systems which continually adjust to changing patterns to relieve congestion at every type of intersection are fully described in a comprehensive set of bulletins available from Automatic Signal Div., Eastern Industries, Inc., East Norwalk, Conn. Whether your problem involves side roads entering main arteries, complicated street intersections, speed controls or other situations, you will find helpful information in this literature. Check the coupon today.

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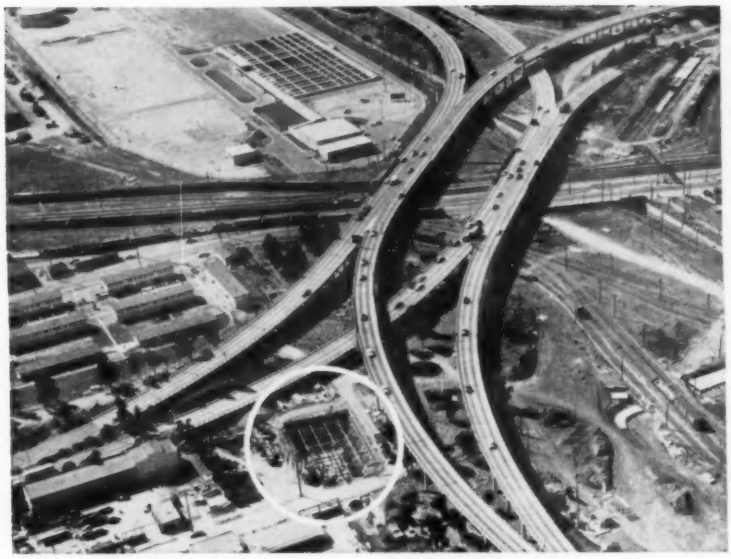
Sanitary Landfill Operation and Methods

28. The location and area requirements for sanitary landfill, operation methods for trench type and area fills, equipment selection and costs are items discussed in an 8-page booklet issued by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. Be sure you have this reference when considering the problem of garbage and refuse disposal. Check the handy coupon today.

Increasing the Efficiency of Bulk Rubbish Collection

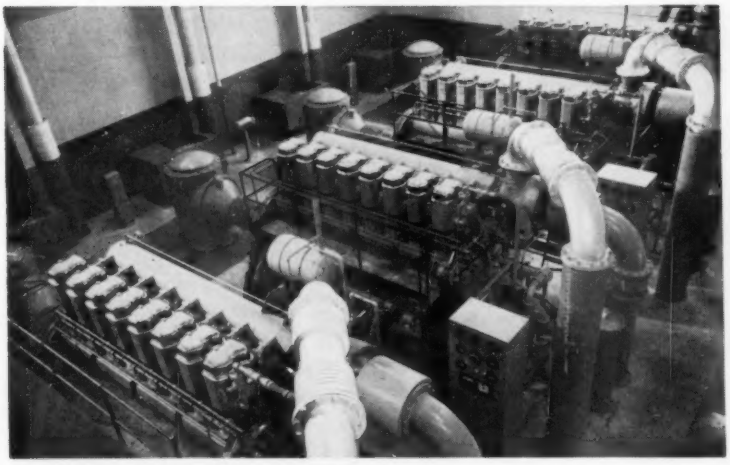
177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the handy coupon.



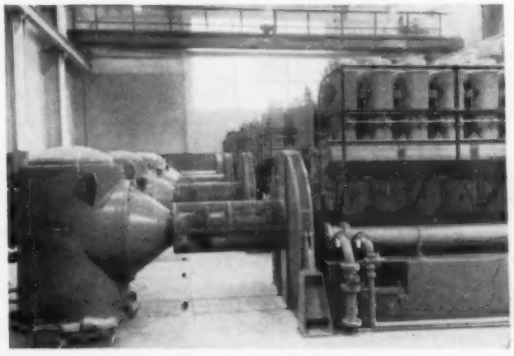
The Oakland storm water pumping station is equipped with four Enterprise Turbocharged Diesels driving huge mixed-flow pumps. Drainage conduits are large enough to drive an auto through.

Early construction stage of new pumping station, heart of the East Bay city's lowland drainage and flood control project.

Let it pour! Oakland licks storm flood problem with new diesel pumping plant



The four 1200 BHP Enterprise DSG-318 Engines are completely automatic, require no attendant. Rising water level starts engines, regulates speeds for proper pumping capacity.



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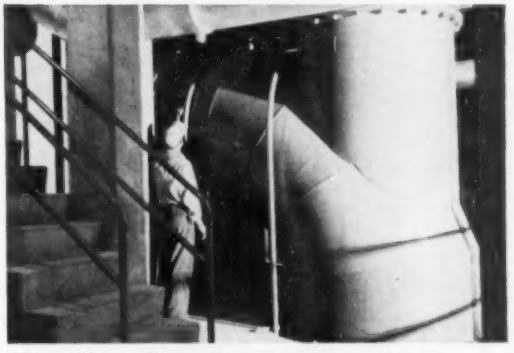

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123. The sequence of operations for fast loading and refuse compaction in the Gar Wood Load-Packer are illustrated and described in 12-page folder W-110, together with size data and details of hydraulic elements. Be sure to check all details of the efficient Load-Packer system. Check coupon or write Gar Wood Industries, Wayne Division, Wayne, Mich.

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63. The "Agricat" tractor provides a small, powerful unit that can be used on lots of jobs. Tight spots are no obstacle. Attachments for dozing, snow plowing, loading. Full data available from Earl H. Penoe & Co., Inc., 2150 Washington Ave., San Leandro, Calif. Check the coupon today.

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224. Dependable Climax power plants are ready for emergency service to insure fire protection, and can also save power costs by peak load operation. Use the coupon for full data on Climax, 40 to 495 HP, operating on sewage or natural gas, butane or gasoline. Climax Engine & Pump Mfg. Co., So. La Salle St., Chicago 3, Ill.

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160. The Smokescope, product of Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh 8, Pa., offers a reliable method for estimating smoke density. This data is the first requirement of an effective program for air pollution control. Find out how easy it is to take smoke density readings. Check the coupon for Smokescope data.

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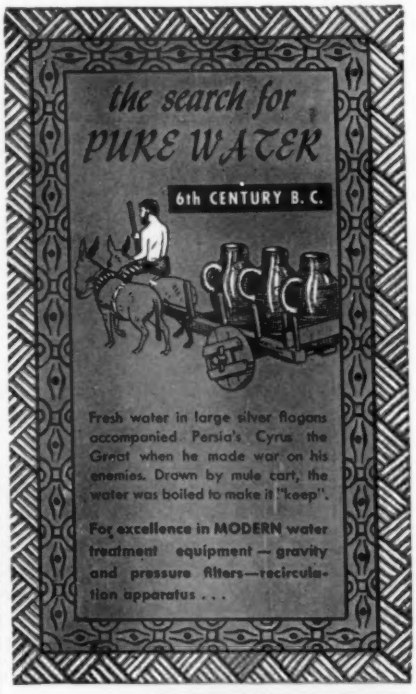
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CONSTRUCTION EQUIPMENT AND MATERIALS

Be Sure to Check Your Tractor Shovel Needs

94. A comprehensive 16-page catalog now available from Frank G. Hough Co., 761 Seventh St., Libertyville, Ill., shows how cities, counties, contractors and others use the Model HR four-wheel drive Payloader on earth and material handling jobs. Be sure to check the ways you could use this machine. Get Form No. 225 by checking the coupon.

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110. Custom-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful 32-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Use the coupon or write to Butler Mfg. Co., Kansas City, Mo.

How to Get Better Grader Operation

111. A most interesting and instructive 20-page illustrated action booklet on how to operate a motor grader is now available from Galion Iron Works & Mfg. Co., Galion, Ohio. Designed to help operators get more effective use from the versatile motor grader, this booklet covers the hydraulic system, steering, tips on leaning wheels, proper blade positioning, turning, gear speeds and operating procedures. Colorful, easy-to-read presentation guarantees good readership. Check the coupon for your copy.

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35. At today's prices, hand digging means the job will be costly. You can dig through asphalt and macadam, work fast and efficiently even in cramped areas with the tractor mounted Sherman Power Digger. From one position you can reach to dig 14 feet behind tractor in 140° arc and dig to a depth of 10 feet. For full details check the coupon. Sherman Products, Inc., Royal Oak, Mich.

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70. Get information on the Dietz "Night Watch" Safety Lantern with special globe design that saves fuel by intensifying light rays into a pencil beam. Full details available from R. E. Dietz Co., Syracuse, N. Y. Just check the coupon for full data.

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173. The low cost of the Blackhawk Trench Hog, a tractor-mounted ladder type trencher makes it profitable for many municipalities to own their own trencher. Be sure to investigate this versatile machine which digs trenches to 8 feet deep, 20 inches wide. Illustrated bulletin available from Arps Corp., New Holstein, Wis. Just check the coupon.

How Air Placement of Concrete Will Help on Your Jobs

215. There are hundreds of jobs that can be done easier and cheaper by air placement of concrete; reservoir, tank and pool linings, concrete maintenance of all sorts are just a few of the applications. Get full details on two models of the high speed, easily operated "Bondactor" from Air Placement Equipment Co. 1009 West 24th St., Kansas City 8, Mo. Check the coupon.

8 Reasons Why You Should Check the Jaeger Loader

207. In a profusely illustrated 16-page catalog devoted to the applications and special design features of the Jaeger "Load-Plus" tractor-loader unit, eight good reasons listed to back up the claim that this machine outproduces any other loader of its size. These include load capacity, balance, reach, maneuverability, automatic power adjustment by torque converter, instant reversal, multiple speed and ease of control. Check them all by getting a copy of Catalog L100-3. Check the coupon today. Jaeger Machine Co., 400 Dublin Ave., Columbus 15, Ohio.

Complete Protection Of Iron and Steel Products

242. What are the advantages of Hot-Dip Galvanizing? Why does it offer complete protection at such an economical cost? You'll find the answers in the attractive booklet "Stop Rust", which gives you the full story of the process plus a comprehensive coating comparison chart. Get your copy promptly by checking the coupon or write American Hot-Dip Galvanizers Assn., Inc., 1st National Bank Bldg., Pittsburgh 22, Pa.

All-Purpose Tractor Introduced by Oliver

391. Be sure to get full information on the Oliver Super 55 tractor, a new model designed to do every kind of municipal job. Takes all equipment, front, rear or side mounted; has built-in hydraulic system. Available with gasoline or diesel power. To get all the facts write The Oliver Corp., 400 W. Madison St., Chicago 6, Ill., or check the coupon.

How to Select Paints For Every Maintenance Need

253. Selecting the right paint for each maintenance need involves consideration of the service to be rendered, conditions of their use and abuse, and the surfaces to which they are to be applied. To help you determine what to use on various surfaces, an industrial paint index printed in the form of a handy file folder has been prepared by the Tropical Paint and Oil Co., Cleveland 2, Ohio. Get a copy by checking the coupon.

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WHITES go cross-country . . . Over make-shift roads . . . Up steep grades . . . *with Mustang Power!*

This fleet of ten White six-wheelers with 183 horsepower Mustang Engines is owned by Keith Williams Company, Riverside, California. Rugged, quality features give the Whites more hauling power and greater work capacity under all operating conditions.

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THE WHITE MOTOR COMPANY • Cleveland 1, Ohio

THE WHITE MOTOR COMPANY OF CANADA LIMITED
Factory at Montreal

FOR MORE THAN 50 YEARS THE GREATEST NAME IN TRUCKS

Thousands use our Readers' Service card to keep up to date . . . do you?

HANDLING 11,000,000 GALLONS PER DAY, the new sewage plant at Salem, Oregon, has Worthington pumps for continuous, economical pumping power. John W. Cunningham & Associates, Portland, Oregon, were the Consulting Engineers for this project.

Salem's sewage system relies on these pumps

". . . since the day our plant opened in 1952, Worthington pumps have been in daily operation — with never a breakdown. And because these pumps are the very life-line of our plant, their reliability has proved invaluable."

That's what Chief Operator Cliff Reed says about the eight Worthington centrifugal pumps at work in the new sewage disposal plant serving Salem, Oregon.

Mr. Reed isn't alone in his opinion about the rugged Worthington units. We've had similar reports wherever Worthington pumps, comminutors or engines have been used — and that means water works and sewage plants all over the world.

Helping municipalities with their sewage and water works problems is our job today — has been for over 100 years. Write today for Bulletin W-317-B16 to Worthington Corporation, Public Works Division, Harrison, New Jersey. W.4.11

"See the Worthington Corporation Exhibit in New York City. A lively, informative display of product developments for industry, business and the home. Park Avenue and 41st Street."

WORTHINGTON

ALL MAJOR PUBLIC WORKS EQUIPMENT UNDER ONE RESPONSIBILITY

Water Works Pumps • Sewage Pumps • Comminutors • Vertical Turbine Pumps • Vacuum Pumps

BLAW-KNOX

Bituminous Paver

APPROVED

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF HIGHWAYS

The approval of the Blaw-Knox Bituminous Paver by the Highway Department of the Commonwealth of Pennsylvania should have real significance to contractors considering the purchase of new asphalt finishing equipment. The State of Pennsylvania is particular about how its roads are laid and the approval of the Blaw-Knox Paver came only after the laying and examination of many miles of road in the Pittsburgh area.

Contractors who plan to buy a new asphalt paver should give serious thought to the savings made possible by wheel operation. The Blaw-Knox Bituminous Paver gives *a better surface at higher speed.* Its mobility cuts relocation time and truck waiting time. Its more simple design *materially* reduces upkeep cost. Don't buy a Bituminous Paver until you have the whole story on the Blaw-Knox.

On wheels it will pave for less

BLAW-KNOX COMPANY
Foote Construction Equipment Div.
1922 State Street, Nunda, New York

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IMPROVED FEATURES

MAKE THE

FRINK ONE-WAY SNO-PLOW

BETTER THAN EVER!

Frink's Famous One-Way Taper-Blade Sno-Plow has been redesigned to make the qualities it is best known for, even more effective.

- ★ Increased Taper of Moldboard
- ★ Increased curvature of plowing surface
- ★ Lighter, more rugged Drive Frame
- ★ Replaceable Chilled Malleable Plow Shoes
- ★ Hinged moldboard deflector on all models

The moldboard has an increased Taper and curvature to prevent snow from coming over the top of the plow — even when speed plowing. The One-Way Sno-Plow also has an improved tripping operation, can trip over higher obstructions, and has a faster, smoother return to plowing position.

The new "400 Series" Frink Sno-Plow is available in 3 models and is interchangeable with the Frink V-Type, Reversible Type, Roll-Over, or Frink Roto-Broom using the same truck attachments.

For further information on this Sno-Plow, write for catalog to nearest address, Box PW551

FRINK SNO-PLOWS

FRINK SNO-PLOWS, INC., CLAYTON, NEW YORK
DAVENPORT-BESLER CORP., DAVENPORT, IOWA
FRINK SNO-PLOWS of CANADA, LTD., TORONTO, ONT.

PUBLIC WORKS ENGINEERING DATA

Water Works Cost Data from Toledo

Excellent cost record data are maintained by the Water Division, Toledo, O., of which George J. Van Dorp is Chief Engineer and Paul M. Kiel is Division Engineer of Construction. On 12,728 feet of 6-inch and 1,613 ft. of 8-inch and 4-inch pipe laid in 1953, average cost per foot was $5.59. On the 6-inch pipe, on 1,497 ft. of 8-inch and on 116 ft. of 4-inch, costs were divided as follows: Materials 49.5 percent; labor 24.7 percent; equipment 11.2 percent; supervision and overhead 8.3 percent; and engineering 6.3 percent.

The 6-inch line costs were also classified in regard to lengths of lines. The cost per foot for 6-inch lines 500 ft. long or less was $6.40; on lines over 500 and less than 1000 ft. long the cost was $5.25 per foot; on lines over 1000 ft. long the cost per foot averaged $4.45.

The average 3/4-inch tap cost in 1953 was $67.83 and the average sale $65.90; on 1-inch taps, average cost was $79.16 and average sale $74.06; on 1½-inch taps, average cost was $182.27 and average sale $186.46; on 2-inch taps average cost was $226.91 and average sale $238.04.

The average cost for raising, lowering and/or repairing curb boxes was $7.25; the average cost for repairing 289 leaks was $34.55. It cost $6.38 to "dig up and turn on or turn off"; and $24.76 to repair broken curb stops.

To repair 3519 5/8-inch meters cost an average of $7.66 each, nearly equally divided between labor and materials—the former slightly in excess. For the 36 3/4-inch meters repaired, the average cost was $12.86; for the 60 1-inch $16.33; for three 1½-inch, the average was $29.87; and for 17 2-inch it was $22.02. For the larger sizes, the material cost increased more rapidly than did the labor cost.

More Slag Used as Trickling Filter Media

According to a Mineral Industrial Survey of the U. S. Bureau of Mines, the use of slag as a medium for sewage trickling filters jumped from 48,168 tons in 1952 to 82,679 tons in 1953. Slag used for this purpose in 1953 was valued at $142,308.

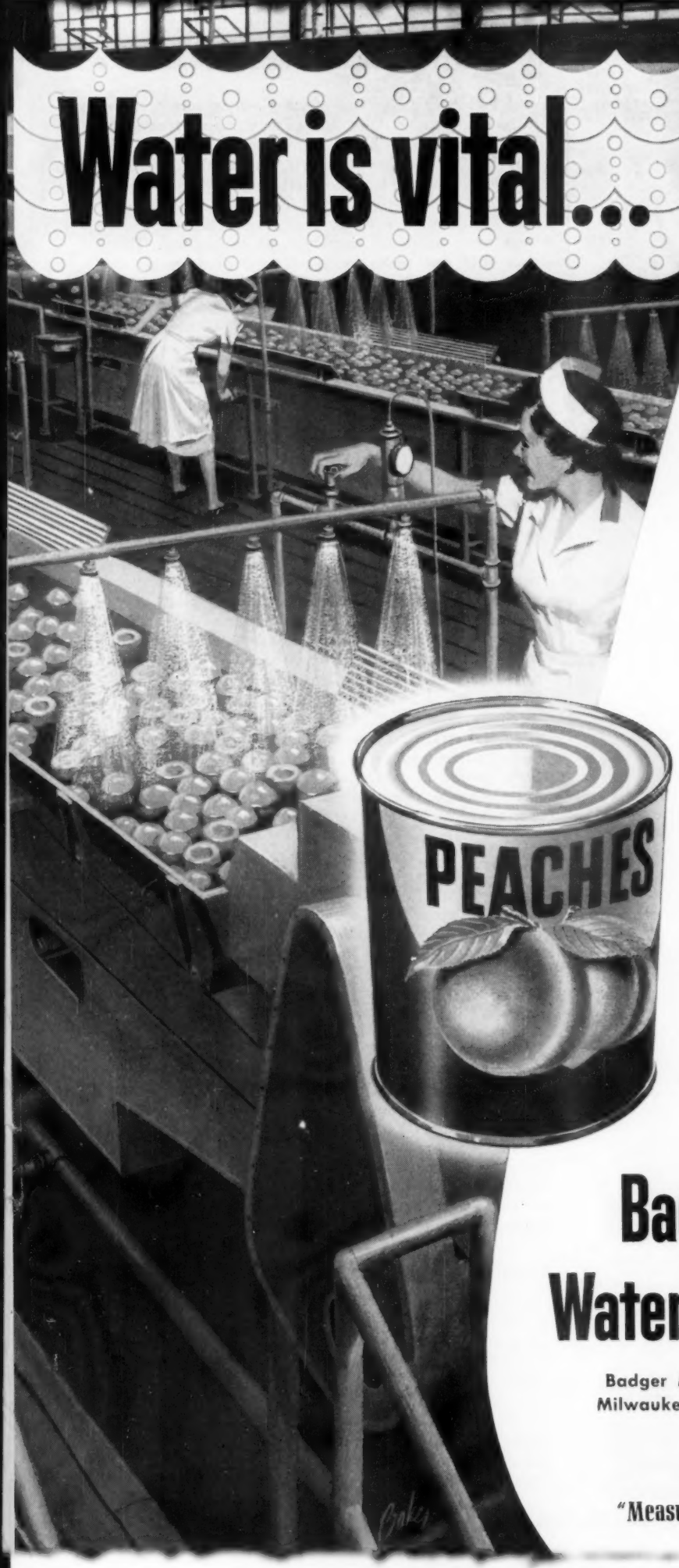
Costs of Sewage Treatment Plant Operation

Costs of sewage treatment plant operation were gathered recently by the Massachusetts Division of Sanitary Engineering, of which Clarence I. Sterling, Jr., is Chief Engineer. Some of the data obtained were published in "Sanitalk," a publication of that Division.

The cost of operation of primary treatment plants includes salaries, chemicals, utilities, normal repairs

Water is vital...

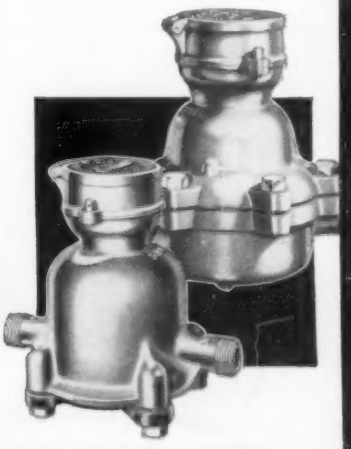
Badger meters conserve it better!



More than 37-billion cans of food were used by American families last year . . . yet it took *more water than produce* to make these canned products available. For example, more than 15 pounds of water were required for every pound of canned vegetables sold.

Little wonder, then, that Badger meters serve so importantly in thousands of communities. They make certain that homes and industries receive a fair share of the water supply . . . pay only for the water they use.

Famous Badger meters measure water precisely . . . help eliminate waste . . . make water departments more efficient and self-supporting. And service records prove the dependability of Badger meters . . . prove that there are no finer water meters to be had — anywhere!



Badger Water Meters

Badger Meter Mfg. Co.
Milwaukee 45, Wisconsin

"Measuring the water of the world for 50 years"

NEW IDEA IN TRAFFIC STOPPERS ... at NEW LOW PRICES!

They slip over your present signs restoring their "newness," hence your present signs are never out of service. Now in Red... the new idea in Stop signs and reflectorized, of course... for effective night and day service, (also in standard traffic yellow). Attach in less than 5 minutes... and the cost?... less than half that of ordinary traffic signs!

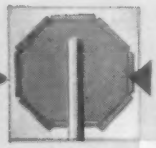
GRACE "EZ-ON"® FACES

...are the 'hottest' item in the sign industry today. In wide use by several Highway Departments for over 3 years.

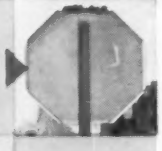
"EZ-ON"® FACES
being applied at 6th and Washington in Paducah, Ky.

STANDARD COPY OR YOUR OWN

They're made of 30 ga. steel and are furnished in two shapes... octagon and diamond... and in 2 sizes... 24 in. and 30 in. May be applied in less than 5 minutes, and without taking present sign out of service. Any copy you may desire... standard and regulatory, or your own special copy if you prefer. Now in wide use in New York, Nevada, Texas, Minnesota, Kentucky, Ohio, Missouri, Iowa and other states and cities. INVESTIGATE..and save. Their cost is HALF that of ordinary signs!



1. You slip 'EZ-ON' Faces over old sign. *Note Wide Flanges.*



2. Then bend flange backward holding 'EZ-ON' Face in place.

3. Use special Crimping Tool to clamp flange and secure sign.

AGENTS WANTED — WRITE FOR FULL INFORMATION

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and incidentals. All cost figures are in terms of per million gallon of daily flow. For primary treatment, for plants of less than 1 mgd flow, the median cost was $24.00; the low was $22.50 and the high was $29.50. One man was normally employed at plants of this size. For plants of 1 to 3 mgd, median cost was $18.70, with a range from $14.00 to $25.95: two men were normally employed at each plant. There was only one plant in the 3 to 6 mgd range; the cost was $24.20 and 9 men were employed. There was also one plant in the over 6 mgd size; operating cost was $13.30 and 18 men were employed at the plant.

For secondary treatment costs were but little higher. For plants using standard rate trickling filters, the following costs were reported: capacity less than 1 mgd, median cost $38.30; range $15.35 to $72.50; average 2 employees. Capacity 1 to 3 mgd, median cost $20.30; range $16.75 to $35.20; average 3 employees. Capacity 3 to 6 mgd, median $15.80; range $13.48 to $45.00; average 7 employees. For the one plant over 6 mgd reporting, cost was $10.65; 23 men were employed at the plant.

One activated sludge plant which treats about 8 mgd reported an average cost of $25.20 per million gallons. Five men are employed at this plant.

The wide ranges in operating costs indicated in many cases bears out the data obtained by a study made earlier this year by Public Works Magazine and reported briefly on page 66 of the September, 1954, issue. It appears there are about as many methods of computing costs as there are sewage treament plants. In some cases bond interest and amortization are included; in other cases omitted. Even sewer system maintenance and similar costs have been considered a part of the sewage treatment plant budget in some communities.

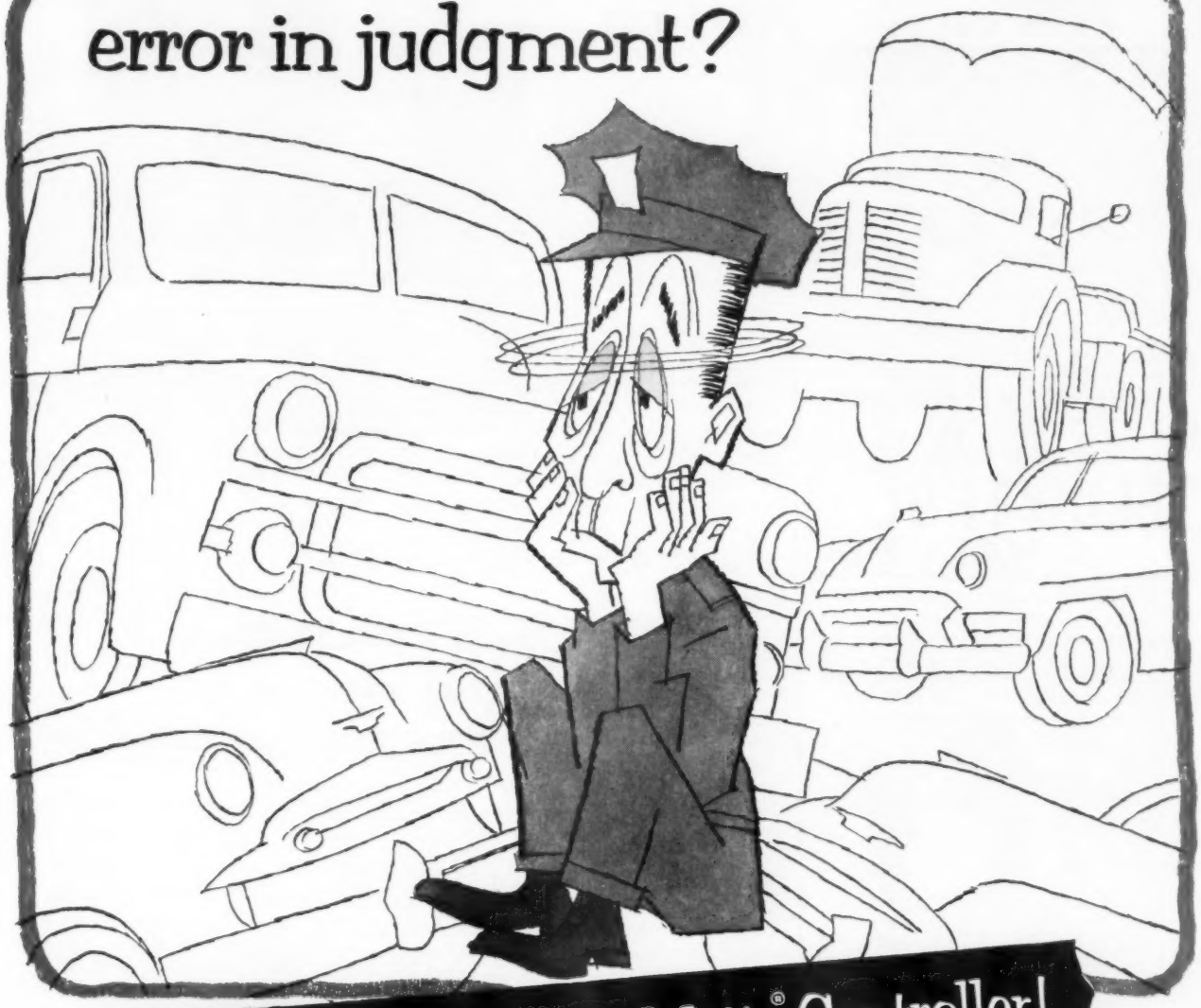
Colored Route Markers Used in Washington State

As an experiment, colored route markers have been used in Washington cities. In Seattle, Spokane and Olympia, orange is being used for northbound travel, blue for westbound, brown for eastbound and green for southbound. An an aid to the motorist, a large example sign is located on each route at the outskirts of the city. This sign shows the color indications for the US Route numbers an inbound tourist is apt to encounter. For instance, an eastbound motorist on US 10 entering Spokane is provided with three separate indications as a guide to travel through the city: First is the brown shield, second is the route number and third is the cardinal direction indication showing him that the route being followed goes east. An advantage of this system is that color can be recognized at a much greater distance than route numbers can be read.

Lighting Arrangement Increases Street Surface Concentration

When mercury vapor lights were installed recently in downtown Bryan, Ohio, the old brackets were used. These are 12-ft. brackets and they mount the lights more nearly over the center of the street so that the greatest intensity of light is away from the curbs. With this arrangement and with the new lights, about half as many poles are needed as with the old incandescent lights. Away from the business area, 8-ft. bracets are used.

error in judgment?



...not with an Electro-Matic® Controller!

It's a nerve-wracking experience, even for top flight traffic cops, to cope with today's traffic. Yet these "unsung heroes" have worked wonders particularly where antiquated signal controls couldn't do the same job. However, with today's unpredictable traffic volumes, errors in judgment are simply the result of human limitations.

Compare the situation with an Electro-Matic Controller on the job. With a super-human electronic brain, and without a jangling nerve in its body, the Electro-Matic calmly controls traffic with amazing results. *More* traffic is moved *faster* . . . without errors. *For technical assistance, please write outlining your specific problems. Complete new catalog on request.*

TRAFFIC ACTUATED®

AUTOMATIC SIGNAL
DIVISION
EASTERN INDUSTRIES, INC.
NORWALK • CONNECTICUT

Thousands use our Readers' Service card to keep up to date . . . do you?

What's your
GATE VALVE
MORTALITY

on installations requiring frequent opening and closing?

REPLACE them
with G-A
FLOWTROL
VALVES

✓ Use the Angle Body and Save the Price of an Elbow Fitting

✓ Built to Last a Lifetime

✓ Operates with Finger Pressure

HERE'S PROOF:
One of America's large railroads had a 6" gate valve installation that operated on the average of 55 times a day. In addition to frequent repairs, this valve had to be entirely replaced every 3 months.

In the Fall of 1947, this valve was replaced with a 6" G-A Flowtrol Valve. Now—more than 7 years later—this valve is still operating perfectly and not one parts replacement has been made!

Want to know more about this unique valve? Write for Bulletin W-8A today.

GOLDEN ANDERSON
Valve Specialty Company
1244 RIDGE AVE., PITTSBURGH 33, PA.
Designers and Manufacturers of
VALVES FOR AUTOMATION

People, Ideas and Events

BY "DOC" SYMONS

H.T.M.A. — And hello in 1955—I'm looking forward to a great year in the water and sewage business. I predict two record breaking conventions, the AWWA Meeting in Chicago in June and the Federation Meeting in Atlantic City in October. —Hope I'll see you at both.

★ ★ ★

In cleaning out my files recently, I ran across a book published in 1938. It was titled, "What I Know About Bridge, and How I Play It," by Marsden C. Smith, of Richmond, Va. The front cover also bore this notation, "From experience gained at AWWA Meeting, Buffalo, N. Y., June 7-11, 1937; N. Y. State Sew. Wks. Assn. Meeting, New York City, Jan. 20-22, 1938; and AWWA Meeting, at New Orleans, April 24-28, 1938."

The frontispiece showed the author at work, making "a six Diamond contract, vulnerable, doubled, and redoubled, little slam with one odd trick." The next page describes the author, his water works experience and inventions. The rest of the book is filled with empty pages.—I wonder if Marsden Smith knows any more about Bridge now, than he put in that book.

★ ★ ★

Swedefinition — Gold Digger: "A girl who hates poverty worse than sin."

★ ★ ★

And this is the story you have been waiting for, about Sam Newkirk, Engr.-Supt., Elizabeth, N. J., Water Comm.—Seems as though when Sam travelled for the Nat. Bd. of Fire Underwriters, many years ago, he found himself short of funds. The simplest solution, obviously, was to go to the local water works office, where he was known, and cash a check.

"Sure", said the Superintendent, "Go over to the cashier's window and ask Jones to cash your check."

So Sam went to the cashier, and Mr. Jones said "Sure, just make the check out to me personally."

"O.K." said Sam, "What's your first name"?

"Florence".

"Florence Jones?" asked Sam.

"Yes", said Mr. Jones, "Want to make anything of it?"

"Look Mister," replied Sam, "I have a joint checking account with my wife, and if a check of mine turns up, made out to Florence Jones, I can look for another banking partner!"

They compromised on Mr. Jones' initials.

★ ★ ★

I see where the State of New Jersey has passed a new Public Employees Retirement System Law. According to Henry Van Der Vliet, Chairman of the Legislative Committee of the New Jersey Sew. and Ind. Was. Assn., this new law "will automatically affect directly many of our membership; it will mean much to the families of many of our membership; it can mean much to many of our membership who are not now identified with any retirement system or Social Security.

Persons in other states, who want to know more about this law, should write to Henry Van Der Vliet, Maywood, N. J., or plan to attend a special one-day meeting of the NJSIWA on March 18, 1955, when the matter will be discussed at the Stacy Trent Hotel in Trenton, N. J.

★ ★ ★

One of the highlights of the Federation meeting in Cincinnati in October was the trip through the Robert A. Taft Sanitary Engineer-

"East Side Plant"—first of 2 new sewage treatment plants for Evansville, Indiana

Evansville joins Ohio River clean-up program

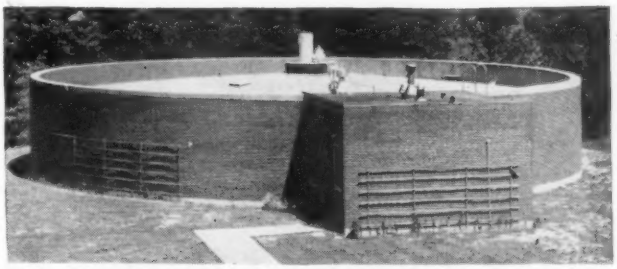
TWO-PLANT, 28 MGD PROJECT INCLUDES PFT "CONTROLLED DIGESTION"

At Evansville, Indiana, the first of two proposed primary treatment plants is completed . . . another stride forward in the 8-state Ohio River Valley clean-up program! Called the "East Side Plant" the new 6 MGD plant adopted PFT equipment for modern "controlled digestion".

The new 75′ digester is equipped with a *PFT Floating Cover* for simplified operation, positive scum submergence and safe utilization of gas. The digester is also provided with a *PFT Supernatant Liquor Selector* for automatic, continuous withdrawal of the best digester liquor. A *PFT Gauge, Sight Glass and Sampler* unit enables operator to keep close control of supernatant.

An important feature of Evansville's "controlled digestion" is the *PFT Digester Heater & Heat Exchanger*, an external heater with a capacity of 750,000 B.t.u. per hour. Fired by either gas *or* oil, it utilizes all sludge gas produced, switching to oil only when necessary.

In the control building attached to the digester, a *PFT Cover Position Indicator* records the digester liquid level at a glance. *PFT Gas Safety Equipment* in the building includes flame cells, flame traps, pressure relief with flame trap, gas pressure gauge and a waste gas burner.



New 75′ Digester with PFT Floating Cover

Contracts have recently been let for the "West Side Plant", a 22 MGD plant designed to serve a population equivalent of 212,000. Specifications for "West Side" call for the following PFT equipment: four 75′ Floating Covers; three 8″ Rotary Sludge Withdrawal Valves; two Heater & Heat Exchanger units; four Cover Position Indicators; four Supernatant Liquor Selectors; four Supernatant Gauge, Sight Glass & Sampler units; various items of Gas Safety Equipment.

Design of plant by / *Consoer, Townsend & Associates, Chicago, Illinois*

P.F.T.

waste treatment equipment exclusively since 1893

PACIFIC FLUSH TANK CO.
4241 Ravenswood Avenue
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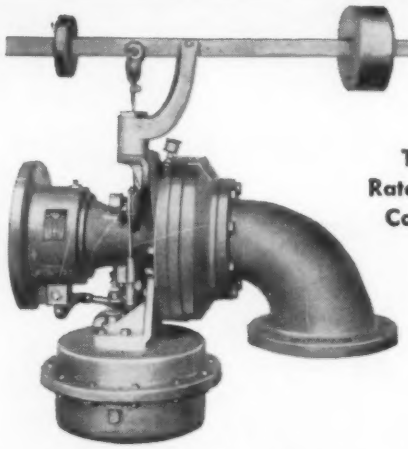

Type S
Rate of Flow
Controller

ACCURATELY CONTROLS RATE OF FLOW OVER LONG RANGES!

Of the most advanced, proven design, Simplex Type S controllers meet all requirements of modern filter plants! Look at these unmatched advantages:

- Compact design, low weight
- Small overall dimensions
- Ball bearing mounted valve shaft
- Hydrostatically balanced, patented guillotine valves
- Horizontal or vertical installation
- Simple direct action design
- Venturi tube type of differential pressure producer
- Quick starting from open position
- Response to slightest differential pressure
- Extreme accuracy of control over long ranges

For bulletin with full information write to the Simplex Valve & Meter Co., Dept. PW-1, 7 E. Orange St., Lancaster, Pa.

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SIMPLEX VALVE & METER CO.

It's a fact... our handy Readers' Service card is the way to get new catalogs.

ing Center of the USPHS. Believe me, this is a far cry from the old laboratories of the PHS at 3rd and Kilgore Sts, where Sanitary Engineering history was made by such names as Hoskins, Streeter, Butterfield, Wattie, Theriault, Ruchhoft, Moore, and many others.

It was good to see some old friends, Ettinger, Wiebel, and Wally Towne, among others, but there was a whole new group of faces; many of them in the fields of radioactivity, air pollution, and other phases of sanitary engineering besides water and sewage problems.

I am sure that many of us who made the trip through the laboratories, felt that here was one place where the taxpayers, all of us, had received our four million dollars worth.

Not long ago, I received an announcement from the Canadian Sewage Assn. I haven't been to one of their meetings for a couple of years, but I still remember some mighty good times I have had with all those wonderful folks. I also remember a story that Charlie Taylor told. Charlie was a leading light in the Canadian Sewage Mfrs. Equip. Assn. He had spent some of his early years with the Fire Underwriters in Brisbane, Australia.

One job assignment, Down Under, was to make some sort of survey on the main street of Brisbane. After almost a whole day spent going in and out of bars, Charlie returned to the office, somewhat "under the weather". The boss-man upbraided Charlie with, "What *have* you been doing? I told you to determine the condition of all of the plugs on the street.

To which Charlie replied, "Oh, I thought you said, 'All of the pubs'!"

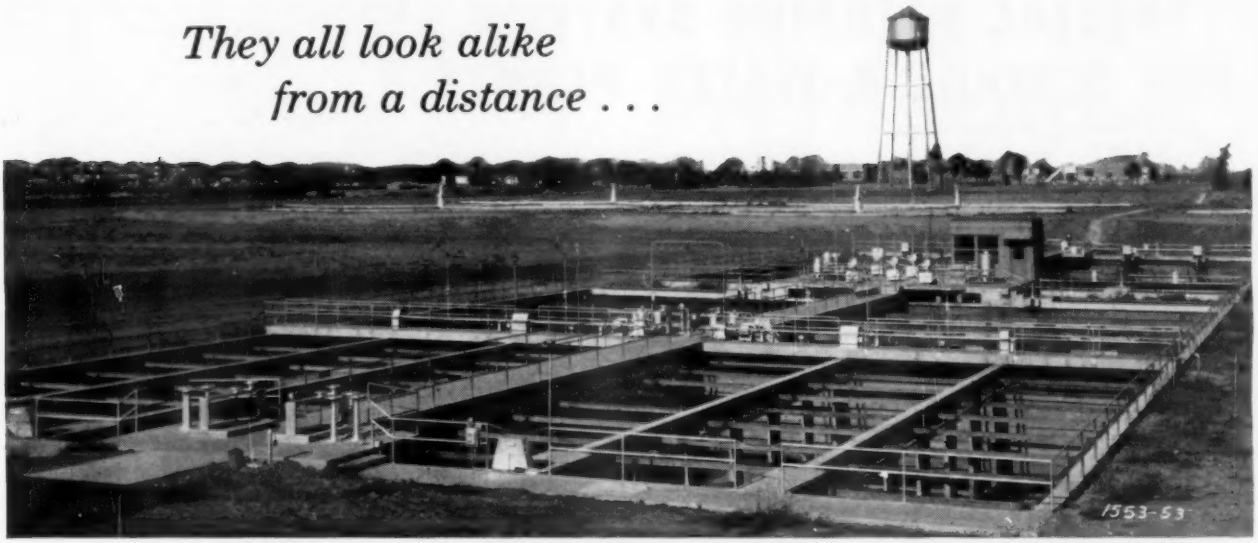
★ ★ ★

Luminuous Quote — "If your efforts are criticized, you must have done something worthwhile." —Anonymous.

★ ★ ★

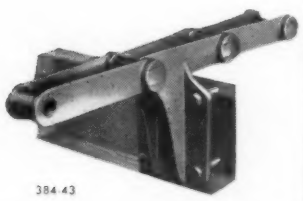
While doing the Federation meeting in Cincinnati, I kept running into the boys from Cleveland: George Flowers, Commissioner, and Jack Wirts, Walter Gerdel, and John Barrett. Frequently, there was another chap with them, and I asked Jack Wirts who he was. Turned out, he was John R. Wolfs, Industrial Waste Control Engineer, in Cleveland. Glad to hear that the big City

They all look alike from a distance . . .

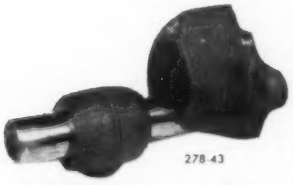


but: THE CLOSE-UP COUNTS

The above Jeffrey sludge collector installation at Dallas, Texas, resembles most modern settling tanks in Sewage Treatment plants. But a detailed inspection would show you several advantages found only in Jeffrey sanitation equipment. If these features (below) are included you may expect top performance and long life from your equipment. Give them a chance on your next job.

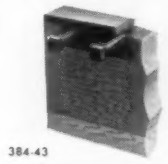


Full Depth flight attachments to prevent splitting of flights.

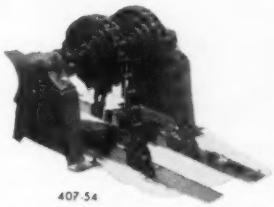


Split type, self-aligning Bearings . . . Easy to install and easy to maintain.

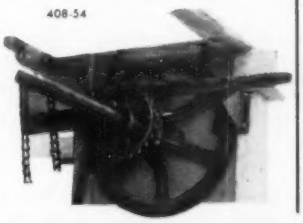
"Hunting Tooth" Sprocket with "Chainsaver" rims . . . takes pressure off sprocket teeth and this together with less barrel contacts with individual teeth gives up to 2½ times the life over standard sprockets.



Knock-out type Wear Shoes in malleable iron shoe holder . . . Long life and easy replacement.



"HYDROLESE" overload Hub . . . Sure positive protection . . . No bothersome shear pins . . . Needs only a grease gun to reset . . . Practically tamperproof . . . Will carry a torque load up to 20,000 inch pounds.



Split offset driving Sprocket . . . Easily replaceable . . . Bearing mounted against wall.

Send for Catalog No. 833-A

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THE JEFFREY MANUFACTURING CO.

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on the Lake has a man handling industrial waste problems.

★ ★ ★

Luminous Quote —"You've got to give in order to make any kind of a contribution in this life."—Anon.

★ ★ ★

Now that Dr. Ralph E. Fuhrman has become Exec. Secy.-Editor of the Federation of Sew. and Ind. Wastes Assns., I wonder—Will the name of the Federation be changed to Federation of Hydrowastes Assns. —It was Ralph's wife, Jo, who originally suggested the word "Hydrowastes" to mean "sewage and industrial wastes."

★ ★ ★

Swedefinition —"Footprints in the Sands of Time—What most of us don't leave, because we are too busy trying to cover our tracks."

★ ★ ★

News Notes from Brushy Bend— Oct. 26—The Long Island Water Conference met at Centerport, L. I., to hear J. E. Winick of Triangle Conduit Co. and Thos. Trent of Borings, Inc. Winick talked on plastic pipe for water service lines; Trent on horizontal borings under streets and railroads.

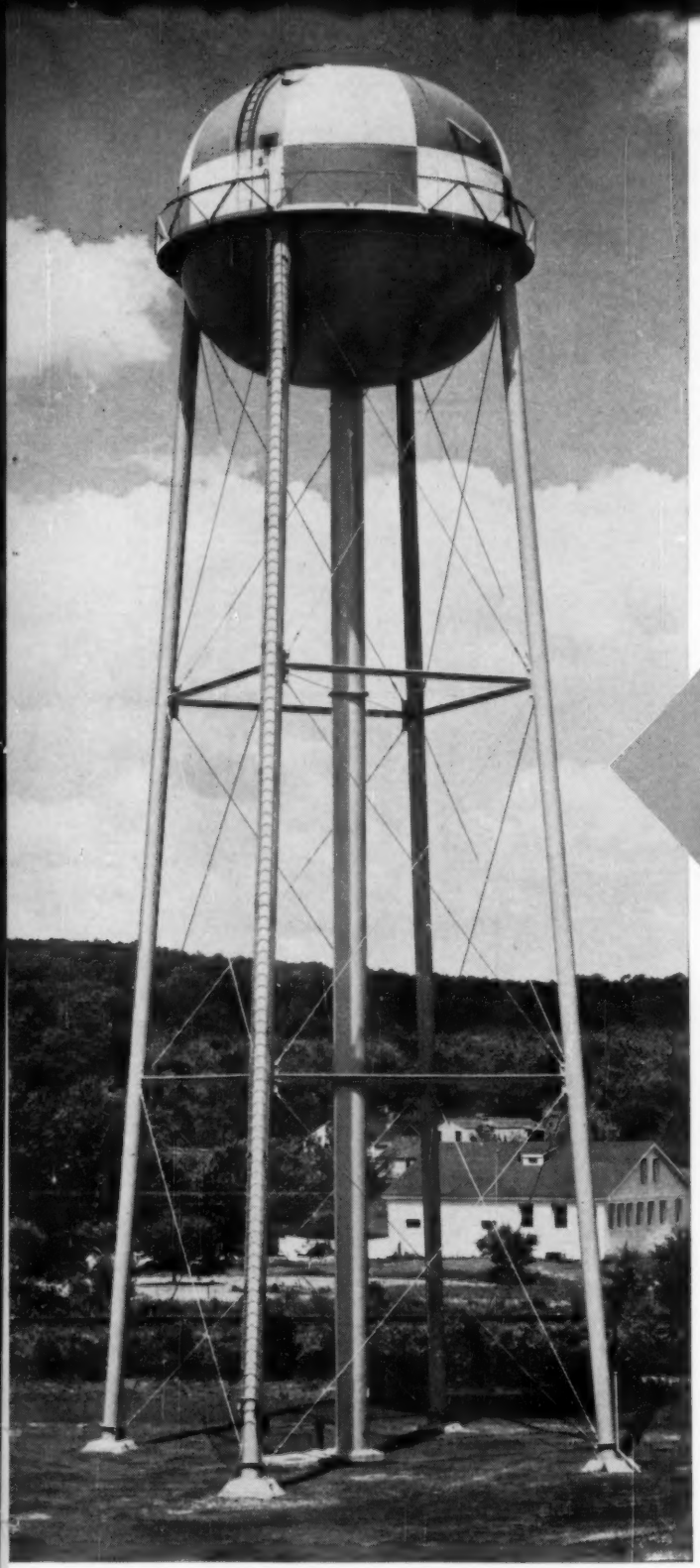
—The Third Water Works Management Short Course was held at the University of Illinois' Robert Allerton Park in Monticello, Ill. on Nov. 17-19. Topics discussed included: Management Responsibility, Letter Writing, Retirement, Internal Control, Budgeting, Public Relations and Work Simplification.

—Nov. 30th was the annual business meeting of the Metropolitan Section of NYSIWA at the Auditorium of the N. Y. City Health Dept. Art Scanlon, Chief. of Maintenance and Operations Bur. of Sew. Disp. Design talked on "Gas Engine Operation", and John J. Rooney, Asst. Civ. Engr. talked on "Intercepting Sewer Maintenance."

—Dec. 1 was the date of the meeting of the Sanitary Engineering Group of the Metropolitan Section of ASCE. "Sanitary Control of Bathing Beaches" was the topic.

—Dec. 3—The North Jersey Water Conference held its second meeting at the usual place, the Y.M.C.A. Cafeteria in Paterson, N. J. Guest Speaker: Guy Beattie, Solvay Sales Corp. Topic: Safe Handling of Chlorine.

V.T.Y.—Doc Symons



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Here's how one man keeps a town on top of its trash

LIKE most cities, Puyallup, Wash., maintains a refuse disposal area. But unlike many, Puyallup keeps its refuse site clean and under control. The 500 tons of garbage and trash hauled there each month collect no flies or rats, spread no odors or disease. One man on a Caterpillar HT4 Shovel sees to that.

As the refuse is dumped from trucks, the HT4 spreads and compacts it, covers it beneath two feet of earth, then packs the surface firmly and evenly. The shovel's 80-inch bucket chews out 1¼ yards of earth at a bite, excavating ahead of the fill, keeping a trench always ready for more garbage. Supervisor Charles Rohlman says, "We love this machine. It's very efficient. And besides taking care of the sanitary fill, we use it for loading City Street Dept. trucks."

The CAT* HT4 Shovel's girder-type frame, cross-braced for extra strength at the hinge point, and its box-section all-welded lift arms, cross-braced to prevent twisting, are two of many reasons this big yellow machine will work harder, longer, than any competitive unit. It works faster, too. One reason: its bucket tips back 30 degrees in the first few feet of lift, holding onto heaping loads of even the loosest material. And it works for fewer tax dollars, using low-cost No. 2 furnace oil without fouling.

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NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

Communities can help Themselves to BETTER LIGHTING

HARRY J. MILLER

THE story of Sarasota well illustrates the principle that a community can achieve its aims if it once captures public interest. For a long time city officials had bemoaned its antiquated lighting system that left large portions of the main streets in deep shadow. To replace the old lights meant a good-sized hunk of change; and this seemed far off in the future, in view of public apathy.

But along came the Diamond Jubilee of Light and the 75th birthday of Edison's electric lamp invention. Sarasotans saw their opportunity. They would tie in a campaign for funds for new street lighting with their own local celebration in honor of the Wizard of Menlo Park.

Almost at the last minute, townsfolk were suddenly told of plans for gala festivities; for dancing in the streets; for a beauty contest; for a parade of ancient vehicles; for prominent officials to speak—all to begin at a special moment on the night of the gala occasion.

Quietly, the local electric power utility canvassed its dealers for miles around and gathered up a slew of electrical appliances donated as free prizes. Television sets, radios and the like were to be given lucky contestants in the various contests. It was announced that the old street lights would be turned off at a signal from Fort Myers, home of Edison's laboratory, a few miles away. There would be a moment of darkness, then new street lights would be turned on, signalling the start of the festivities.

Everybody in the town got into the act. The new light poles were unloaded in the street directly from the long trailers that had pulled them across the country from the factory so they would be in Sarasota in time to be erected for the celebration. Nearby electrical dealers provided needed supplies on time. A leading lamp maker announced the readiness of a new kind of street lamp.

● DEDICATION of new street lights in Sarasota brought out the crowds. Brackets welded half-way up the poles hold streamers and Christmas lights in neat uniformity.

Citizens Approve New Lights

Thus was the proposal for new lighting fanned into flame, and the city council promptly passed an appropriation for necessary funds. Not a citizen protested. Approval from the press lauded the town's action. New overhead wiring was installed to replace the underground cables which had long ago deteriorated to the point where they were a continuing expense and the cause of embarrassing outages.

Alongside the old, low light standards were bedded concrete bases to hold new light poles almost three times their height. The mazda bulbs were replaced with four-tube fluorescents, and at the appointed moment, a signal came from Edison's old Fort Myers home and the old lights on Sarasota's main stem blinked out for the last time. A moment of darkness, then the new lights came on, their deep brilliance bringing loud approval from the crowds, for these lights provide about five times as much light as the old lights—and at the same cost of power.

Thus did Sarasota get its new lighting system, sort of lifting itself by its bootstraps. It was the only city in Florida to so capitalize on the celebration of the Diamond Jubilee. It "saw its duty—and it done it"—by sparking civic interest.

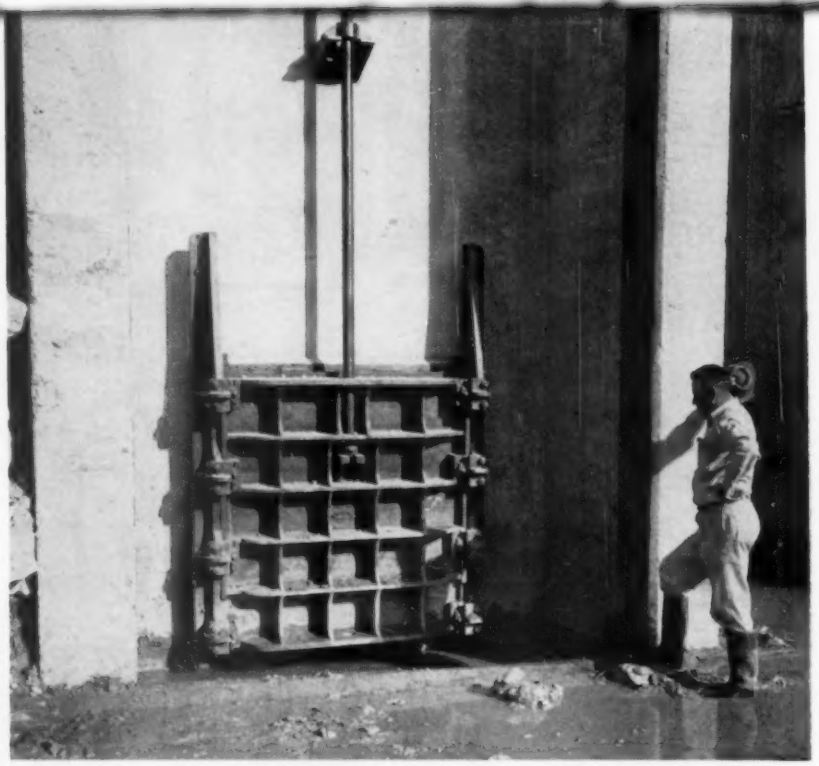
AUSTIN HAD WATER LAST SUMMER

A. H. ULLRICH,

Superintendent

Water and Sewage Treatment,

City of Austin, Tex.



● THIS cast iron bronze-mounted sluice gate is 48 by 60 inches in size. It is one of nineteen sluice gates installed in Austin's new water intake and filter plant.

JUST in time to meet the demands of peak usage months, Austin, Texas, opened its new water plant during the first week of July. During July the peak day usage reached 56,000,000 gallons. This was 10,000,000 gallons higher than ever before. Had it not been for the new plant, city-wide rationing would have been necessary.

Austin is one of the few southwestern cities that has an ample source of water supply. The Colorado River carries a potential 800,000,000 gallons daily past Austin's doorstep. The problem is to clean up the water and bring it up into the house and the shop.

The old filter and pumping plant which takes its water from the Colorado River below Lake Austin, was adequate for Austin's 90,000 people in 1945. With a design capacity of 22,000,000 gallons daily, the plant strained at the seams to furnish the 46,000,000 gallons needed on a peak day in 1954 to satisfy the domestic and industrial thirst of 170,000 citizens.

The new plant has a design capacity of 25,000,000 gallons daily, with a summer overload capacity to 37,500,000 gallons daily, and it can be expanded by unit building to supply up to 125,000,000 gallons. Raw water is lifted from Lake Austin, an element of the Colorado Basin, run through purifying and protective treatments and pumped into the city's enlarged distribution system. It is unlikely that any Austin citizen will have occasion to worry about a supply of water to run his home or business in the near future.

The new water plant project includes a lake intake and low service pump station; access road; raw water supply line; lime softening plant consisting of a chemical building, necessary chemical feed machines, flocculation, settling basins with continuous sludge removal equipment, and filters; administration building which houses offices, laboratories, and machine shop; clearwells; and a high service pump station. The entire plant, including equipment, structures and land, cost approximately $3,000,000. This was financed by both revenue and general obligation bonds. This cost is exclusive of a force main addition to the existing system.

The low and high service pump stations and the chemical building are designed to permit installation of additional equipment to bring the capacity up to 50,000,000 gallons daily without extension of the structures.

Equipment Data

All sluice gates in the new installation's lake intake and low service pump station are Rodney Hunt cast iron bronze-mounted gates. Four 48 x 48-inch gates and five 60 x 60-in. gates are used in the low service pumping station; and 10 gates of various sizes in the main filter plant to control flow in the rapid mix and flocculating basins.

Screens in the intake are Link-Belt, automatically cleaned. Fairbanks-Morse vertical low service pumps at the intake raise water to the plant; DeLaval horizontal centrifugal pumps deliver water from the clear well to the distribution system.

Lime and ferrous sulfate are applied by Wallace & Tiernan dry feed machines installed in duplicate. There are three flash mixers which can be used in series or in parallel. There are also three flocculating basins equipped with Jeffrey paddle wheel stirrers. The detention time is 45 minutes. These are followed by three Dorr equipped clarifiers having a detention period of 4.7 hours.

There are nine filters, each 36 ft. by 22 ft., with a surface area of 792 sq. ft. which at a 2.5 gpm rate delivers 2.77 mgd each. The total output at the 2.5 gpm rate is 25 mgd. The filtering medium is anthrafilt having an effective size of 0.6 to 0.8 mm and a uniformity coefficient of 1.75. Bed thickness is 27 ins. The supporting material is graded 3/16-

3/32 to 1-5/8-2-7/16, with a thickness of 18 ins. The underdrain system is of 3-in. cast iron pipe laterals on 12-in. centers with 3/8-in. perforations on 6 1/16-in. centers. The upward wash rate is 32 ins. per minute. Surface wash of the Palmer type is provided. Wash water is supplied from two tanks of 90,000 gals. capacity each located in the top of the building.

Each filter is equipped with Infilco air operated rate controllers, plus the usual rate-of-flow and loss-of-head gauges. There is also a master controller, actuated by the water level in the clarifier, which controls the filtering rate on all of the filters.

There are two clear wells, each of 2.4 mg capacity.

Provision has been made for both prechlorination and postchlorination, and for ammoniation. Equipment includes three Wallace & Tiernan machines each with a capacity of 400 lbs. per 24 hours. There are two W & T ammoniators and a W & T chlorine residual recorder.

Freese & Nichols of Fort Worth were the Consulting Engineers. Resident engineering and inspection was handled by the City of Austin's staff. The Rex Kitchens Construction Company of Austin held the general contract on the main plant and high service pump station. James C. Williams, Inc., of Dallas was the general contractor on the lake intake, low service pump station, access road, and raw water supply line.

● **AUSTIN settling basins foreground; flocculating tanks and main building rear.**

SINGLE STAGE BIOFILTER SERVES TWO COMMUNITIES

DAVID R. MILLER, Project Manager, Daniel, Mann, Johnson & Mendenhall

STARTING out with the fortunate circumstance of having an almost ideal treatment plant site donated to them, the Morro Bay and Cayucos Sanitary Districts are rapidly completing a program of providing sewerage facilities for their respective districts. Key feature of the program is the Morro Bay-Cayucos Sewage Treatment Plant now being completed. Early in 1952 these two California districts retained Daniel, Mann, Johnson & Mendenhall as consultants to investigate the feasibility of constructing a common treatment plant to treat the wastes from the districts. The engineers' report was favorable and elections were held to authorize general obligation bonds to finance the treatment plant and trunk lines. It was decided that the first cost should be allocated on the basis of the estimated population of each district with operation and maintenance costs to be charged on the basis of measured contributing flow.

The design of the biofilter plant is based on a population of 10,000 by 1972. As a result, designs provided for an average flow of 1.0 mgd with storm flows up to 2.5 mgd.

The effluent requirement of the State Water Pollution Control Board fixed the suspended solids at less than 85 ppm; the settleable solids at less than ½ ml per liter; and the ether solubles at less than 15 ppm. It is permitted that 10 percent of the 24-hour composite samples may exceed these standards but the effluent at all times must contain less than 125 ppm of suspended solids, less than 1½ ml per liter of settleable solids and less than 20 ppm of ether solubles.

The sewage flow enters the plant through an 18-in. vitrified clay trunk line. The sewage coming to the plant is generally a normal domestic sewage with little industrial waste; but it is expected that temperature and BOD may be higher than normal due to the long distance of flow in the collection system. Coarse solids are removed by a bar screen with 1¼-in. clear openings. A pumping station equipped with 4-in. Fairbanks-Morse bladeless trash pumps lifts the sewage to the primary clarifier which is a rectangular tank, equipped with Link-Belt collectors, 15 ft. by 55 ft. by 10 ft. swd, providing 1½ hours detention at design flows. The secondary clarifier is 15 ft. by 75 ft. by 10 ft. swd, providing 1 hour detention. The primary and secondary clarifiers were set together, a saving being effected by utilizing a common wall and common drive for the two clarifiers. Perforated corrugated metal pipe was used for the effluent bounders on both the primary and secondary clarifiers.

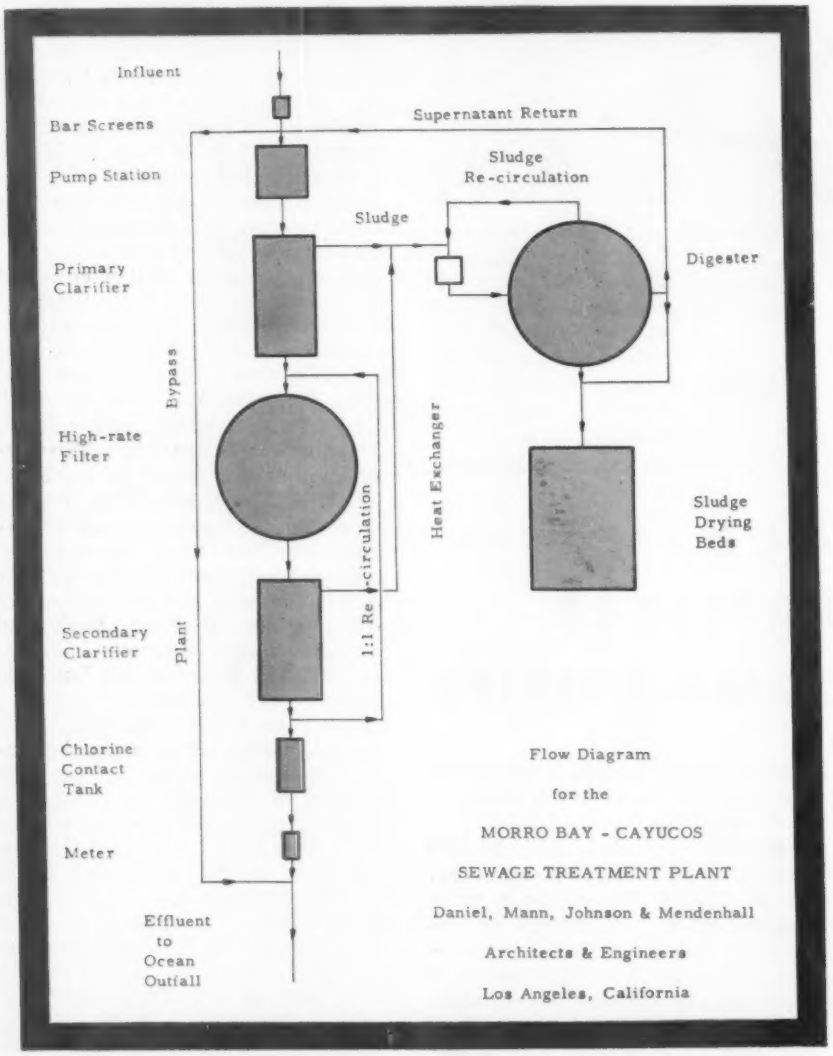
The filter loading (2.5 lbs. BOD/cu. yd.) is higher than usual practice and at such loading the unit will serve primarily as a roughing filter. A major saving in cost evolved from the use of this high loading and from the use of concrete block rather than concrete for the walls of the filter. The filter is 60 ft. in diameter and 5½ ft. deep. The volumetric loading is 30 MGAD at 1:1 recirculation. The filter distributor is Dorr. Effluent from the filter is pumped by a Fairbanks-Morse wet pit pump to the secondary clarifier.

From the secondary clarifier, flow may be either recirculated back to the filter or allowed to spill over into a chlorine contact tank from which it flows through an outfall to the ocean. Sludge from the clarifiers is pumped to the digester through a PFT heat exchanger by a Marlow sludge pump. The digester is 40 ft. in diameter and 16 ft. swd. Design is based on 2 cu. ft./cap. A Fairbanks-Morse 4-in. trash pump is provided to recirculate the sludge to maintain a pre-set temperature. Sludge pumping and recirculation may be controlled either manually or automatically by settings on a time clock and timer. Digested sludge is run onto sand drying beds for de-watering. Provision is made for both pre-chlorination and post-chlorination by the inclusion of a Wallace and Tiernan 400-lb. capacity chlorinator.

Several alternate designs were prepared for the ocean outfall. The most economical design turned out to be a thick wall steel pipe held down by creosoted wooden piling. The steel pipe is protected from corrosion by the installation of a cathodic protection system furnished by the Electro-Rustproofing Company.

The design of a small treatment plant such as this poses many problems for the designer. Each item must be critically evaluated—use against cost—to enable the plant to be constructed within the available funds. Also the designer must bear in mind the operation of the plant and try to keep the operation cost at a minimum. On this particular plant, the engineers have prepared a manual giving recommendations for the operation and maintenance of the plant.

The Maino Construction Company of San Louis Obispo was low bidder at $177,500 for the plant. Daniel, Mann, Johnson & Mendenhall designed the plant and supervised the construction with J. E. Ballinger acting as resident engineer.



● **ORGANIC loading on this plant is 2.5 pounds of BOD per cu. yd. of media.**

Gravel Road Maintenance

HOWARD G. MINIER,
Superintendent and Manager,
County Board of Road Commissioners
Ann Arbor, Michigan

TAKING care of roadsides on the 66-foot right of way of our gravel roads consists of the repair of shoulder ruts and washouts; brushing; weed mowing; dead tree removal; and spraying. We consider the most important phase of this maintenance item to be the mowing of the high weeds and grass which encroach on the roads during the summer months.

We make at least one shoulder cut with tractor mowers on all roads during the summer. Brushing is mostly confined to corners for vision; brush control using chemical sprays has been used on a limited scale. This roadside service is expanded or contracted according to the money available and the work load at a particular time.

Cleaning out ditches is an extremely important item. Most of our gravel roads were lightly graded in the first place and unless they have been reconstructed in recent years the roadside ditches are not adequate to provide the necessary drainage. Our practice has been to pick out the troublesome spots where our roads fail during the spring breakup, or go under water. We attempt during the dry season to ditch as many of these sections as possible, using motor graders, end loaders, and trucks. This past year we have purchased a Gradall ditching machine which has worked out very satisfactorily, especially where we have been unable to use the motor graders due to unstable soil conditions. We have learned by experience that if the ditch material is unstable it should not be placed in the road bed. In such cases, it is used to widen the grade on narrow sections of road in the area. If the material is satisfactory for base construction it is used to raise the grade.

The maintenance of our cross road culverts is a year around headache. The trend is to replace the older drainage structures with round or squash type corrugated metal pipe. The ease of assembly and the economy of installation are the principal reasons for the use of pipe of this type.

This is abstracted from a paper presented at the ARBA National Highway Conference of County Engineers and Officials, held in Columbus, Ohio.

which may result in disintegration

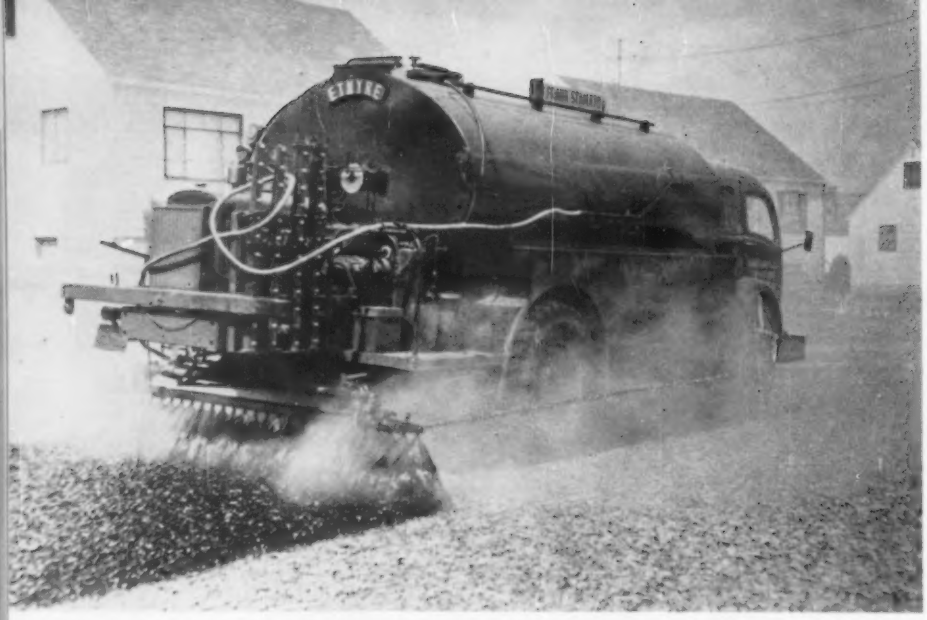
● **BUILDING** a bituminous street surface with a Caterpillar diesel No. 12 motor grader. Methods of design and construction are described in this article. Photo from Caterpillar Tractor Co.

MATERIALS and EQUIPMENT for BITUMINOUS RESURFACING

LEO J. RITTER, JR.

MANY THOUSAND miles of roads and streets may be made to serve the demands of modern traffic, and of traffic demands expected in the reasonable future, by widening and resurfacing. The resurfacing of deteriorated pavements has come to be accepted as an economical and satisfactory means of salvaging the investment previously made in pavement construction. This method is useful for old bituminous, portland cement concrete, and block pavements. Resurfacing can provide a smooth, non-skid surface and contribute considerable strength to the existing pavement structure. In many cases, the new surface will provide the additional thickness and strength required to withstand the stresses set up by today's heavy wheel loads.

In a sense, this article is a sequel to a paper "How to Make Old Roads Fit for Today's Traffic" by the late George Martin, formerly Highway Consultant to PUBLIC WORKS. This outstanding treatment of the subject is available in reprint form. At appropriate points, reference will be made to Mr. Martin's text; the present article will amplify and extend the data therein, particularly



● **BITUMINOUS distributor is essential equipment in many kinds of resurfacing. Etnyre distributor on White truck is owned by Frank Stamato & Co.**

with respect to bituminous resurfacing methods.

Before undertaking a resurfacing project, it is obvious that a study of the economic justification of the project should be made. Such an analysis may be very detailed or somewhat cursory, depending upon a variety of factors. According to Robert H. Tittle (8), "Such a study should give consideration to the adequacy of existing grade, alignment and width for probable future traffic; the cost of conditioning the existing pavement, including foundation correction, for both maintenance and resurfacing; and the cost of the resurfacing and other work entailed in the program". A general rule of thumb is that resurfacing will probably be economical when from 2 to 3 percent of the total pavement area requires patching each year. Obviously, also, the money available and the priority of a given project may have a great deal to do with a decision as to whether or not a particular resurfacing project will be undertaken at any particular time.

Analysis of Existing Conditions

It is apparent that a comprehensive study of the condition of the existing surface and related factors is highly desirable before undertaking a resurfacing project. Such a study may be extremely detailed when time, facilities, personnel, and the necessary records are available. A detailed study of this type will normally be made on a project being considered by a state highway department, a large county or city, or similar agencies. A detailed study may not be feasible for a smaller organization with limited personnel and records; in such a case, reliance must be placed upon the judgment and experience of the engineer.

Details of a complete study of this type are beyond the scope of this article. Procedures are discussed thoroughly in Bulletin No. 47 of the Highway Research Board (8). Included among the factors which should be given detailed consideration are the following: (1) History of pavement; (2) existing physical condition; (3) character of existing and anticipated traffic; and (4) relation of geometric design to safe and efficient operation of anticipated traffic.

Pavement Defects: It is obvious that defects in the pavement structure and their causes bear a close relationship to measures which are necessary for rehabilitation. It does very little good to attempt to correct a rough bituminous surface by applying a new wearing surface if the basic trouble lies in poor drainage or a weak subgrade soil. Sufficient analysis should be made of any defective surface to determine the underlying cause (or causes) of the trouble. As any experienced maintenance or construction engineer knows, this is much simpler to say than to do, since not one, but a combination of factors is usually involved.

Common defects in portland cement concrete pavements may be summarized as follows:

(1) Gradual wear, exposing the aggregate in the surface—not serious unless aggregate is dislodged, which may result in disintegration and pot-holing.

(2) Scaling, which may be due to many different causes, such as repeated freezing and thawing, effect of oil or chemicals spilled on the surface, etc. Exposure of aggregate may result in disintegration and structural failure.

(3) Transverse cracks, usually not serious if due to contraction of the concrete; may be serious if due to subgrade failure.

(4) Corner cracks, which may be caused by excessive loads, inadequate structural strength of the slab, or subgrade failure.

(5) Longitudinal cracking — old roads may have been built without a longitudinal joint. If a longitudinal joint is provided, the trouble may be due to excessive load or to subgrade failure.

(6) Hair cracks, due to faulty curing or over-working of the concrete during construction—not serious, unless scaling results.

(7) Frost heave—due to poor drainage in combination with a frost-susceptible soil; cause must be corrected before resurfacing.

(8) Slab settlement—due to subgrade failure; cause must be corrected.

(9) Pumping—due to a combination of excess water, heavy loads, and a soil susceptible to pumping; cause must be remedied.

Common defects in bituminous surfaces include the following:

(1) Surface wear resulting in removal of bituminous material from the tops of aggregate particles—not serious, unless bitumen is removed from between the aggregate particles.

(2) Shoving (waviness)—usually due to basic instability of the paving mixture.

(3) Rutting (lateral displacement)—usually due to the same cause as shoving.

(4) Bleeding—caused by an excess of bituminous material in the mix.

(5) Irregular cracking—may be caused by improper mix design, use of too-hard a bituminous material, poor aggregate, lack of traffic after construction, poor construction, or subgrade failure; for any given case careful study may be required to determine the cause (or causes) of the failure.

(6) Raveling—frequently caused by a deficiency of binder.

(7) Transverse cracking—usually develops over planes of weakness in the base or subgrade upon which the pavement is placed.

(8) Frost damage; frost heave

may occur because of frost action in the underlying soil layers. During the spring thaw, frost boils and pot holes frequently develop because of excess moisture trapped in the subgrade or base. Poor drainage and the existence of a frost-susceptible soil are the causes.

(9) Settlement—a short or long section of bituminous pavement may settle because of consolidation of the subgrade soil or improper compaction of the base or subgrade.

Preparation For Resurfacing

Steps which may be necessary before resurfacing begins may be grouped as follows:

(1) Correction of basic difficulties: These operations most frequently will be concerned with the correction of drainage deficiencies and subgrade weaknesses. Steps taken to remedy these difficulties may often require that the existing pavement be torn up and removed, either partially or completely. The work may be done over the entire length of a pavement section, or be confined to a small area. The material composing the old pavement may or may not be used in the new pavement.

(2) Repair of the old pavement to put it into condition to serve as a base for the new wearing surface. Where subgrade and drainage problems are not a factor, or in other cases where complete reconstruction of the old pavement is not required, measures may be undertaken to repair the existing pavement structure. These measures include partial replacement of the pavement, patching of either flexible or rigid pavements, stabilization of rigid pavements by such operations as mud-jacking and undersealing, and the base strengthening of rigid pavements. The partial replacement and patching of both rigid and flexible pavements is discussed in detail in an article by the late George Martin "Patching Pavements Properly", which appeared in the June, 1953 issue of PUBLIC WORKS (this article is also available as a reprint). The stabilization of rigid-type pavements by mud-jacking, undersealing, and related operations was covered in detail by Martin (7). The base strengthening of rigid pavements is discussed briefly below. In some cases, the total thickness of a flexible pavement may have to be increased before a new surface is applied: this may be done, for example, by the use of a leveling course of plant mix between an old pavement and a plant-mixed wearing surface. Operations of this type are discussed in a later section.

(3) Widening and/or the installation of a center divider. To meet the demands of faster moving traffic and to increase the traffic capacity of the road, many older pavements require widening. Widening operations are often carried out at the same time as resurfacing. Occasionally, it is expeditious to provide greater safety by the installation of a center divider of some type on an existing roadway. Both of these operations were also discussed by Martin (7).

Base Strengthening of Rigid Pavements: Old concrete pavements may begin to deteriorate rapidly under the effects of the heavy loads of modern traffic. Where the old slab is in reasonably good condition, the additional thickness required to withstand heavy loads may be provided by resurfacing with portland cement concrete or a bituminous mixture. In come cases, base strengthening may be accomplished by the construction of a granular blanket (minimum thickness 6 inches) over the old pavement, prior to the application of the new surface. A dense-graded crushed stone with no clay content is ideal for this purpose. The blanket should be at least one foot wider on each side than the existing pavement and should be thoroughly rolled to achieve maximum density.

In cases where the old pavement is so badly broken up that uniform heaving on the subgrade is not possible, it may not be necessary to remove the old slabs. They may be cracked into sizes which are small enough to allow uniform heaving on the subgrade, using a pavement breaker. Resurfacing operations may then be carried out with greater assurance of success.

Use of a Heater-Planer: In some situations, particularly on city streets, the replacement of a high-type bituminous pavement becomes necessary because of gradual deterioration (oxidation) of the top one-half inch or so of the pavement. A pavement of this type also may become rough because of the formation of bumps and waves of shallow depth. Frequently, the rest of the pavement structure is perfectly sound and capable of carrying traffic without other signs of distress.

In these cases, it becomes desirable to remove the top fraction of an inch of the pavement and then apply a new high-type surface. Because of traffic demands in cities, resurfacing of principal streets with anything other than a high-type surface is a waste of money, since other types will not stand up. Hot-mixed, hot-laid asphaltic concrete and sheet asphalt are the mixtures most commonly used. The old surface may be removed to a shallow depth by the use of a machine which applies intense heat to the existing pavements, softens it, and "planes" it off to the desired elevation and cross-section; these units are called "heater-planers".

Courtesy Galion Iron Works & Mfg. Co.

● **ON A bituminous resurfacing job: One of Galion's "Roll-O-Matic" tandems.**

Machines of this type have been built by various governmental agencies and are available commercially. One such machine of this type is made by Littleford Bros., Inc., Cincinnati, Ohio. Operations performed by such a machine include heating, cutting off the heated high spots and gathering and windrowing the material. In one type of machine, the heating equipment is located in the front half of the unit; it consists of a heating hood (50 inches wide and 100 inches long) fitted with eight evenly spaced oil burners. The cutting blade is located back of the heater and is adjustable for angle and depth of cut. It is designed so that planing can be done to within three inches of curbs, where necessary. A second blade, located to the rear of the machine, gathers and windrows the planed material; material may be windrowed either to the left or right.

This specific unit is mounted on pneumatic tires (tandem axles) and is designed so that a true plane is secured at all times. The entire unit is 35 feet long and 8 feet wide, and weighs about 14 tons. Its forward speed ranges from 16 to 70 feet a minute.

Material which is windrowed behind the heater-planer may be picked up by a tractor-mounted shovel or self-propelled loader, and loaded into trucks. Very frequently, this material is suitable for use in patching work, shoulder stabilization, widening projects, and similar work. The new plant-mix surface may be placed over the newly planed surface by conventional methods; since so little material is removed, the placing of the new surface may require careful planning in order to avoid excessive work in adjusting the elevations of existing curbs, manholes, etc.

Resurfacing of Portland Cement Concrete Pavements

Portland cement concrete pavements are generally resurfaced with one of the following materials: (1) Portland cement concrete; (2) bituminous concrete; or (3) bituminous concrete reinforced with welded wire fabric.

The details of resurfacing Portland cement concrete pavements by the use of either Portland cement concrete or bituminous concrete were presented fully by Martin (7). The resurfacing of concrete pavements with concrete is covered in detail in Bulletin No. 47 of the Highway Research Board; information relative to the design and construction of concrete overlays is also available from the Portland Cement Association, 33 W. Grand Avenue, Chicago, Illinois.

Resurfacing with bituminous concrete reinforced with welded wire fabric is known as the "fabric-in-asphalt" resurfacing process.

Fabric-in-Asphalt Resurfacing Process: When a bituminous mixture is used to resurface an old concrete pavement, difficulties are often experienced later because the cracks and joints of the old pavement are reflected in the new surface under the action of traffic. The "reflection cracks" thus caused in the new surface may lead to raveling, the development of potholes, and increased maintenance costs. This difficulty has been largely overcome by the recent development of the "fabric-in-asphalt" resurfacing process, in which the new bituminous surface is reinforced by sheets of welded wire fabric; the fabric may be laid only over joints and cracks or over the entire pavement area. Use of the fabric has proved successful in reducing the number of cracks which form in the new surface; cracks which do form are not as wide as those formed when the pavement is not reinforced, may seal themselves during hot weather, or are easily sealed with a light bituminous material. Some use has been made of welded wire fabric in the construction of new bituminous pavements subjected to very heavy loads, such as at bus stops, in order to control shoving and cracking.

Modern development of the fabric-in-asphalt process began in 1946, with its use in the resurfacing of 8 miles of U. S. 90 in Liberty County, Texas. Since that time, installations have been made in various sections of the country, including additional jobs in Texas, Indianapolis (bus stops and airport resurfacing), Illinois, New Jersey, Minnesota, District of Columbia, Colorado, and Pennsylvania. Recommendations (4) of the Wire Reinforcement Institute, Washington 4, D. C., are included in the discussion of the construction process which follows:

Before any bituminous surfacing is placed, the old concrete pavement must be free from dirt, foreign material, and moisture. Dirt must be removed from cracks and joints, which are then sealed with a regular asphaltic crack and joint filler. Quite frequently, the new surface will consist of a leveling course, binder course, and surface, all composed of asphaltic concrete. The purpose of the leveling course is to adjust the crown of the pavement, or to fill up outstanding depressions; its use may not be necessary on some jobs. The welded wire fabric may be placed between the concrete pavement and the binder course, or between the binder course and the surface course, as desired.

If the wire fabric is placed between the binder and surface courses, the binder material is spread mechanically, and it is recommended that this binder course be not less than 1½ inches thick. This layer is rolled with a heavy steel-wheel roller to the proper density and smoothness. The welded wire fabric which is used should conform to AASHO specification M55. Welded wire style 3 x 6—10/10 is recommended. This means that the fabric is made up of No. 10 gage wires, spaced 3 inches center-to-center in one direction and 6 inches center-to-center in the other. The fabric should be furnished with a maximum allowable projection of

● **WELDED wire fabric is being used now in asphaltic concrete resurfacing.**

the wire beyond the outside transverse and longitudinal wires of one inch.

The wire fabric is furnished in flat sheets, wide enough to reinforce the entire width of the pavement being spread by the paver, allowing a maximum clearance of 3 inches from the edge of the asphaltic concrete. On recent jobs, the sheets have been 11½ feet wide (for a 12-foot pavement) and 7 or 8 feet long. The sheets are placed so that the 6-inch spaced wires are parallel to the centerline of the road, with the 3-inch spaced wires being perpendicular thereto; they are laid with the 3-inch spaced wires down. The sheets of fabric are lapped a distance at least equal to the distance between adjacent wires and tied together on longitudinal wires only, so as to hold the sheets in place.

The wire fabric is placed immediately ahead of the paver. The operation must be conducted so as to prevent distortion of or damage to the sheets by trucks hauling over them or by the paver. Various "hold-down devices" have been developed to hold the sheets firmly in place as the tracks or rollers of the paver pass over them. To prevent the trucks from distorting the fabric ahead of the finishing machine, the following procedure is recommended:

(1) Lay and tie enough sheets in front of the machine to allow the first asphalt truck to back up on the mesh in readiness to unload.

(2) Lay and tie in front of the machine and truck only enough sheets of fabric to allow the truck on the mesh to discharge its load.

(3) After the first truck has unloaded and is moving away, repeat the above operation.

Courtesy J. D. Adams Mfg. Co.

● **GETTING ready for resurfacing, these Adams motor graders are working in Richfield, Minn. On resurfacing, each grader did 1800 to 2400 ft. of mix per day.**

After the surface mixture is placed, it is compacted by a heavy steel-wheel roller until the desired density and smoothness are obtained.

Resurfacing of Bituminous Pavements

Resurfacing operations for bituminous pavements are, in general, carried out in much the same fashion as the construction of new surfaces on new bases, assuming that the old base or wearing surface has been brought to a satisfactory condition previously. Many different sorts of bituminous mixtures have been used in resurfacing operations. The most widely used are the following:

(1) Surface treatments and seal coats; and (2) high-type bituminous paving mixtures, particularly asphaltic concrete and sheet asphalt.

These two types are discussed in some detail in the remaining portions of this article. Brief mention is also made of road-mix methods of resurfacing.

Surface Treatments and Seal Coats: Surface treatments and seal coats are widely used to rejuvenate old bituminous pavements which have become badly weathered, "dead-looking", or have a multitude of small cracks; and to provide a "non-skid" surface over a slippery pavement (usually caused by an excess of bituminous material). Treatments of this type are not generally used in situations in which it is necessary to increase the thickness of the pavement structure appreciably, since they are usually very thin. A considerable thickness (more than one inch) may be built up by construction of a multiple surface treatment or "armor coat". Coverage in this article is confined to single surface treatments and seal coats.

Treatments of this type are built by the "inverted penetration" method. That is, a uniform application of bituminous material is made to the old surface, followed by a single spread of aggregate; the aggregate is then rolled to embed it in the bituminous material. Coarse aggregates are used in surface treatments; fine aggregates (sand) in seal coats.

Aggregates: State highway department specifications, and those of other agencies, set forth detailed requirements concerning the nature and gradation of aggregates suitable for use in this type of work. In general, aggregates are crushed stone, crushed slag, crushed gravel, or sand—material which is clean, hard, tough, and durable in nature. The aggregate is essentially one size, containing very little fine material.

Bituminous materials: Many different types and grades of bituminous materials are used by various organizations in this type of work. Local experience apparently is the prime factor in making a choice for a given job. Included are the following:

Alphalts—Rapid-curing cutbacks, grades RC—2, 3, 4 and 5; medium-curing cutbacks, grades MC—2, 3, 4 and 5; slow-curing liquids, grades SC—3, 4 and 5; asphalt cement, penetration grades 150-200, 200-300; and asphalt emulsions, rapid-setting, grade RS—1

Tars—Road tars, grades RT—6, 7, 8 and 9

These materials are applied at appropriate temperatures. There is a general trend toward the use of more viscous bituminous materials in this type of work.

Quantity of aggregate is critical. If too much is used, some will not be embedded in the bituminous material

Table 1—Amount of Stone, Pounds per Sq. Yd.

Max. Size. In.	Slag	Stone
3/4	23	28
1/2	16	20
3/8	13	17
1/4	11	13
Sand	8-10	—

and will whip off under traffic. Too little aggregate may result in another slippery surface. The quantity of aggregate can be determined by covering a square yard one stone thick, plus perhaps 10 percent for spreading inaccuracy. Suggested amounts (5), in pounds per square yard, are shown in Table 1.

Figures in Table 1 are based on weights of 1900 pounds per cubic yard, loose measure, for slag and 2400 pounds for stone.

Quantity of Bituminous Material: The quantity of bituminous material is also critical. It may be determined by laboratory testing and analysis

Table 2—Quantity of Bituminous Material

Maximum Size of Aggregate, in.	Gallons per square yard
3/4	0.38
1/2	0.28
3/8	0.23
1/4	0.18
Sand	0.15

(See Retention of Cover Stone by Asphalt Surface Treatments, Bulletin No. 133, Texas Engineering Experiment Station, College Station, Texas) or by experience. The quantities shown in Table 2 are recommended (5) on the basis of experience:

The lighter grades of bituminous material should be used with the smaller aggregates, and heavier grades with the larger aggregates. The grade of bituminous material to be used is also affected by climate, seasonal conditions, temperature, and other factors.

Construction procedure: The basic construction procedure is very simple. It includes the following: (1) Preparation of base; (2) application of bituminous material; (3) spreading of aggregate; and (4) rolling.

Base preparation: Preparation of an old surface for re-surfacing has been discussed previously. The surface must be dry, free from dust, and free from depressions into which the bituminous material might flow and collect. A sweeper or a blower may be used to remove loose material from the surface immediately prior to treatment.

Weather conditions: Like many other forms of bituminous construction, surface treatments are best done in hot, dry weather. Both the surface to be treated and the aggregate should be essentially dry, except when asphalt emulsions are used, when they may be slightly damp.

Application of Bituminous Material: Bituminous material is spread by a pressure distributor, with the material heated (if necessary) to the proper temperature. It is essential that this application be at the specified rate and uniform over the entire width and length of treatment. When an application is to be made to a section adjacent to one previously treated, building paper should be spread over the treated surface for a sufficient distance back that the sprayers are operating at full force when the new section is reached. The paper is then removed and destroyed. A pouring pot or hand spray should be used to touch up the spots inevitably missed by the distributor. Spraying of adjacent pavement, curbs, lawns, etc., can be avoided by placing a shield at the ends of the spray bars.

Spreading of aggregates: The aggregate is applied in a uniform manner by the use of a mechanical spreader. Several types of spreaders are available and can do a satisfactory job, including vane, disc, and hopper spreaders. Trucks should be backed over aggregate previously spread, so that there is no traffic over the fresh bituminous material. Care must be taken to see that a uniform spread of aggregate is achieved.

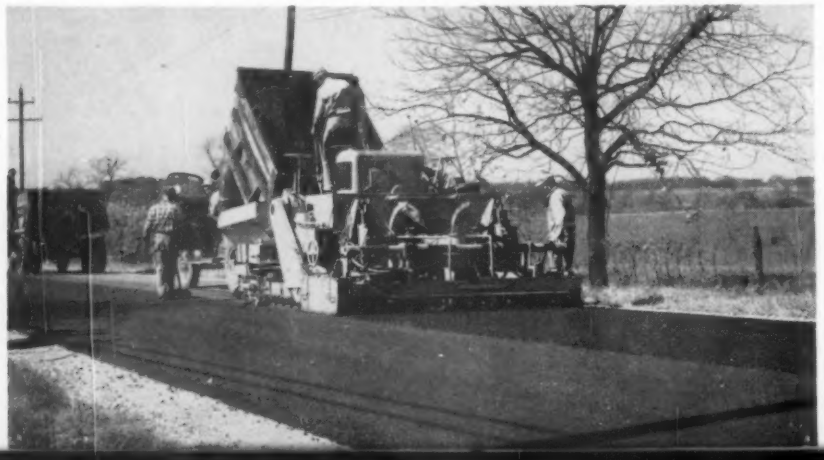
Rolling: Rolling begins immediately after the aggregate is spread. Steel wheel rollers of the three-wheel or tandem types are used. The usual weight is 5 tons, although various specifications call for weights from 3 to 8 tons. As rolling proceeds, it is usually accompanied by spreading and smoothing of the aggregate by the use of a broom drag. A minimum amount of brooming is desirable, so that the aggregate will be disturbed as little as possible. Rolling is continued until the aggregate is firmly embedded in the bituminous material. Excessive rolling is not desirable, since the aggregate may be crushed. Pneumatic-tire rollers are used occasionally in this work. Immediately after rolling is complete, the road may be opened to traffic.

Road-Mix Resurfacing

Occasionally, it is desirable to tear up an old bituminous surface, add new material, and relay the new mix to provide a strengthened and rejuvenated wearing surface. This sort of construction may be desirable if the old surface reveals defects caused by an inadequate subgrade or base; while the old pavement is torn up, subgrade or base deficiencies may be corrected before the pavement is re-laid.

Such construction is generally carried out by road-mix methods. The old pavement may be broken up by a ripper or the scarifier attachment on a blade grader, working in conjunction with a bulldozer. Further pulverization, blending, and mixing may be carried on by the same machines. Special machines have been developed for breaking up the old pavement; one of these tools is the Hyster grid roller. Many traveling plants are capable of performing pulverizing, blending, and mixing operations successfully.

Additional aggregate, additional bituminous material, or both, may be added, depending on job conditions. Amounts to be added are generally based upon local experi-



● **TYPICAL procedure in laying bituminous concrete is shown in this view of a Jaeger paver in operation.**

Courtesy International Harvester Co.

● **PORTABLE asphalt plant, Barber-Greene, 200-ton capacity, powered with IHC diesels. Hazelmere Bituminous Co. owner.**

ence and judgment. Frequently, the original construction is duplicated as closely as possible. An example of this is seen in the resurfacing of many secondary roads in the Rocky Mountain states; the original pavements were built by using road-mix methods, slow-curing liquid asphalts, and natural gravels. When these roads are subjected to moderate or heavy traffic, it is frequently necessary to re-work the old surface, using the same method of construction, to provide satisfactory service under increased traffic loads.

After the new materials have been mixed thoroughly with the old, the mixture is spread in a layer and rolled. Frequently, a seal coat is used as the final step in the process of reconstruction.

Using High-Type Bituminous Mixtures

Roads and streets which carry heavy truck traffic should be resurfaced with high-type bituminous paving mixtures, since these are the only bituminous pavements which are satisfactory for such conditions. Of the various mixtures which have been used, asphaltic concrete and sheet asphalt are by far the most popular. Sheet asphalt is widely used for the resurfacing of arterial city streets, and is less frequently used on rural roads. Both types of mixture are most often mixed and laid at elevated temperatures. If the road or street does not carry truck traffic, less expensive, single-aggregate types of plant mixtures can be used satisfactorily.

Thickness: There are no commonly used methods of determining the required thickness of bituminous resurfacing. The resurfacing may be accomplished in one, two, or three courses. If the old surface is quite rough or has extreme variations in crown, a leveling course may be used; its purpose is simply to smooth out large irregularities. A binder course of plant mix may then be placed, followed by the surface course itself. The binder course frequently, though not always, uses aggregate with a greater maximum size than that of the surface, contains less asphalt, and is somewhat cheaper. For example, coarse, dense-graded asphaltic concrete may be used in the binder course and fine, dense-graded asphaltic concrete in the wearing surface. If the surface is constructed in two courses, the binder course also fulfills the function of a leveling course. Occasionally, particularly if the new surface is 2 inches (or less) in thickness, it is placed in one course. On heavily traveled routes, general practice is to use 3 inches of two-course resurfacing; on less heavily traveled routes, 2 to 2½ inches of resurfacing is generally adequate.

Mixture design: As with new high-type surfaces, very careful attention must be paid to the design of an asphaltic paving mixture for resurfacing, in order to insure that the new pavement will be stable and durable, and produced at the lowest possible cost. A recent report (11) indicates that the Marshall stability test and the Hubbard-Field stability test are the laboratory test methods which are most widely used by the states in designing high-type bituminous mixes for new surfaces; it is presumed that similar practices prevail in the design of resurfacing mixtures. Both of these laboratory test methods are described elsewhere (10, 12). Rigid specifications are applied by virtually all organizations to control the nature and grading of the aggregates and mineral filler, and the composition of the mixture (for example, see specifications for Federal Class I, Asphaltic Concrete Pavement, and Class J, Sheet Asphalt Surface).

Preparation of old surface: Methods of preparing the old surface have been discussed previously in this article. Special attention should be given to removal of excess bitumen

● **CHIP spreader laying down cover for a surface treatment. Procedure involves application of bitumen, a single cover of aggregate and rolling. See page 71.**

from the old surface, the filling of cracks, and the patching of small defective areas. The old surface should be dry and the resurfacing is preferably done in warm weather. Immediately prior to placing the new surface, the surface should be swept clean of all dust, dirt, and other foreign material, using a power sweeper. Customarily, a tack coat (single application of liquid asphalt, road tar, or asphalt emulsion) is then applied, with the rate of application varying from 0.05 to 0.15 gallon per square yard. If the old surface is in good condition and is rich in bitumen, the application may be very light (fog coat); if the old surface is badly weathered and dried out, the full rate of application is used.

Steps in Building

Construction procedure: As with high-type paving mixtures for new surfaces, construction steps can be broken down as follows: (1) Preparation of the mixture; (2) transportation of the mixture; (3) placing of the mixture; (4) construction of joints; and (5) rolling and final finishing.

High-type bituminous mixtures are proportioned and mixed at central mixing plants. Mixing plants may be either batch or continuous-flow types and vary in size from the semi-portable plants normally used by a contractor on a rural highway job to the tremendous stationary plants operated by large cities and counties. In the latter category, for example, is the plant operated by the Borough of Manhattan, New York City; it is capable of producing as much as 1200 tons of hot-mix in a working day. At the present time, it is solely engaged in producing sheet asphalt for the maintenance and resurfacing of Manhattan's streets. Very careful plant control and inspection is a prerequisite to production of a uniform mixture having the desired properties.

The prepared mixture is hauled from the plant to the job site in trucks. It is then dumped, still hot, into the hopper of a self-propelled paving machine. The paver uses no side forms, lays the material true to line and grade, and gives it a preliminary finish. The pavement is then rolled with heavy steel-wheel rollers until the desired density and smoothness have been obtained. The pavement is normally placed one lane at a time, so that a longitudinal joint is necessary; proper formation of this joint presents no particular difficulties.

Details of the construction process are fully and rigidly controlled by applicable specifications; they are discussed in many available references (For example, see (8) and (10)).

Details of the design and construction of high-type bituminous pavements will be covered in a later article in PUBLIC WORKS by the author.

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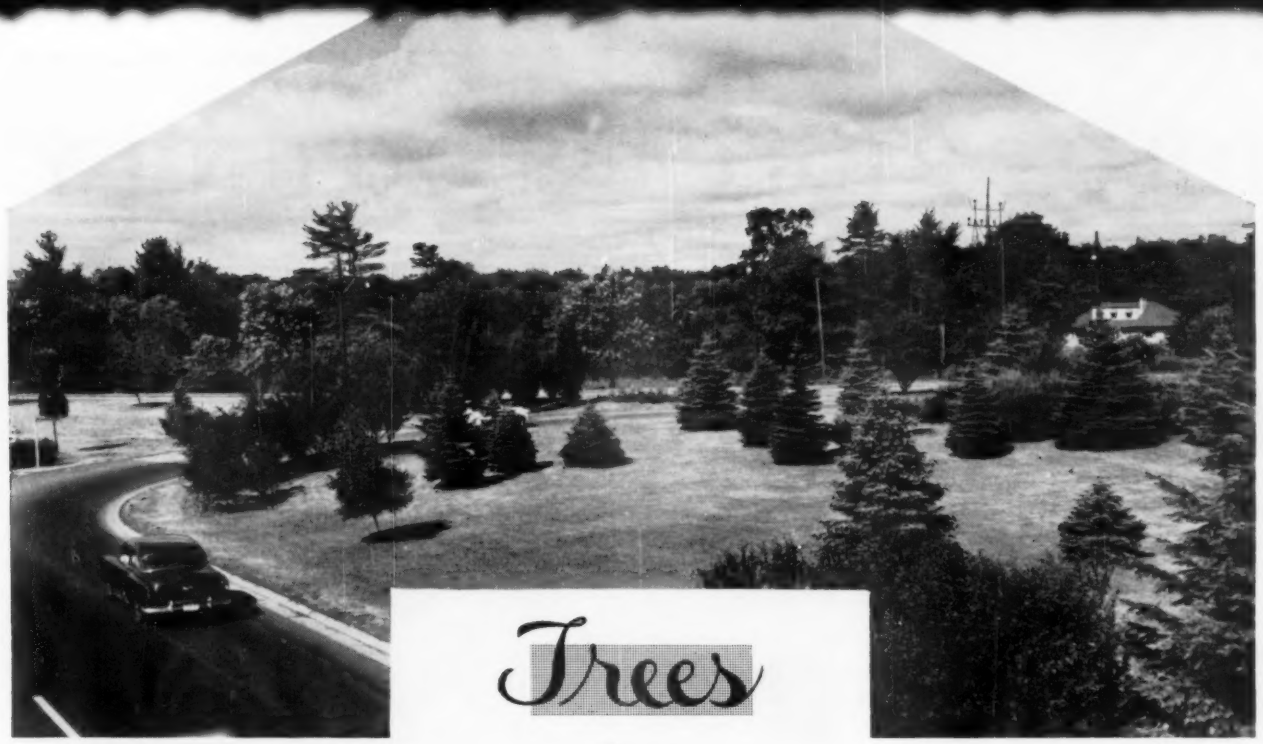
Courtesy Huber Mfg. Co.

● **SEALING and backrolling on resurfacing near Atlanta, Ga., using Huber 8-12 ton tandem roller and Barber-Greene spreader. Contractor was E. Jack Smith Co.**



Trees for HIGHWAY LANDSCAPING and WINDBREAKS

JAMES MONTAGNES

AVENUES of beautiful trees, suitable to the particular climate, will line Ontario's main roads in years to come as a result of a landscaping program now underway. In the past year 326,465 trees and shrubs were planted on Ontario highway borders, varying from maples and elms to pines and spruce, and including thousands of shrubs. The new trees are planned to make motor travel "a thing of beauty"; to blend in with the natural Ontario countryside attractions; and in winter to provide an essential windbreak so as to eliminate the use of snow fences.

Policy of the Ontario department of highways is to replace one tree for every one destroyed in highway construction. Recent plantings have been greater than the number of trees destroyed through new road building. Where possible existing trees have been saved on new construction jobs. A limited number of full-grown trees weighing up to one ton each, were moved frozen for immediate effect in chosen surroundings. A few years ago these trees would have been destroyed in highway construction, but under the new planning of the department's forestry service they will continue to grace Ontario roadsides.

Before deciding to save a tree, studies are made of changes that will take place in soil surroundings and water table. If a tree is to be saved, it must be determined if it will flourish in its new surroundings. Soil which was formerly lost, is now carefully stockpiled before the grading of a new highway begins, and spread at the end of the construction phase. This makes for great savings when the road is finally dressed up with grass, trees and shrubs.

In the past year seven species of maple were planted, along with six kinds of pine and 29 varieties of flowering shrubs. A total of 57 varieties and species were chosen for their beauty, usefulness and suitability to their surroundings.

As an example of what is being done, the controlled-access highways 400 and 401 in the vicinity of Toronto had 90,000 trees and shrubs planted alongside in the past year. In a few years motorists on highway 401 will pass between a bank of roses six to eight feet high and as many feet wide. Some 25,000 Rosa Multiflora shrubs were planted in the north Toronto area of this highway as well as flowering crab shrubs, red barberry, lilacs, spirea and weigele Bristol Ruby. Three varieties of maple trees, birch, poplar, pine, spruce, white cedar and elms were also planted. The hedge of shrubs will not only beautify the road but also serve to keep children and pedestrians off the fast expressway, and in winter will act as a snowbreak.

Other main roads are being similarly beautified with trees and shrubs.

The Ontario government's own forestry nurseries supply most of the trees planted along the roads. The young tree or shrub is carefully nurtured, and when planted along the road, power-driven augers are used to bore holes 18 to 24 inches in diameter. They are filled with mulch and soil and the young tree or plant is carefully tended until the root systems are established and permanent growth well begun. This involves planned watering and staking until growth is assured. Experience shows that less than five percent of the total plantings fail to survive; and it is expected most of the trees will live for a hundred years.

While the Ontario department of highways pays for practically all these plantings, in the Toronto area a former mayor, Thomas Foster, left a sum of $100,000 for the purpose of planting and maintaining trees on the approaches to the city. The income from the bequest is being used to plant trees on new highways now being built in the Toronto area and to build evergreen windbreaks at expressway cloverleaf intersections.

PROSPEROUS COUNTY DEVELOPMENT *Follows New Water Supply*

GUY BROWNING ARTHUR

WHEN Decatur was the village county seat of DeKalb County, a poor agricultural section in Georgia, a new settlement was made a few miles to the west. This was Atlanta, which became the county seat of Fulton County, and later the state capital. The two cities and their counties have been scrambled ever since. But Atlanta developed into the business metropolis of the Southeast, and spread so far that it now touches the western border of Decatur and invests the southern border.

Then the record drought of 1925 came along, and water was so scarce that Atlanta, with bigger facilities, had to supply some water to the adjoining county. It seemed that "Big Brother Atlanta" would take all of Decatur and most of DeKalb County.

But there the tide reached high water mark. Men in Decatur had a vision. They drew a plan to save Decatur, expanded it to cover the whole county, and made it a reality. It was for an adequate supply of water for residential and industrial development. Today DeKalb County is strong. It is the best area for expansion of Atlanta's industries. It is also residence quarters—living room, bedroom and bath—for a growing number of Atlanta's population.

● **Aerial view of the county treatment plant. One of the lakes is shown in the background. River intake, lakes and plant are on county-owned property.**

The Engineering Plan

It is a practical demonstration of the broadened scope that attracts the attention of engineers and planners. Many other cities and towns that once stood apart find their corporate limits extending to abut on the limits of adjacent places. Planning and engineering for one place come into conflict with that for adjoining towns and cities. Water supply becomes common to a community; sewage treatment plants can be built to serve several places economically; streets are joined at the borders to become neighborhood thoroughfares to super markets, banks, stores, amusement places and service shops.

Whether the broadening of localized views of community needs is the province of engineers alone, or of relaxed collaboration with many others, is beside the question. And whether initiated aggressively or compelled by the logic of planning, this development of areas rather than of individual small towns is right ahead of us.

The description of DeKalb County's remarkable development is a description of the water plant that made the county. Everything else that has happened rests on the county water system for a foundation. It shows how a community that was about to become a province used public works to make itself an empire.

Both Atlanta and Decatur took their water from the Chattahoochee River, which rises in the foothills of the Great Smoky Mountains in northeastern Georgia. It flows southwestward above Atlanta and becomes the western boundary for the southern half of the state. When the drought of 1925 came the river was so low that neither city could get enough water; but the larger place, with better facilities, got most of it. At the time this is written the river is lower than it was during that drought, yet there is no shortage. Better engineering, better plants, and better intakes get enough

water, even though the river can be waded across.

In the tightening rivalry between the two cities the dominant fact was that DeKalb County lies entirely within the metropolitan area of Atlanta. In all but governmental matters the two are one. They are served by the same utilities, and share the same cultural assets, such as opera, universities, parks, theatres and art galleries. All the great hospitals are used by both counties. Four of the six white colleges and universities are in DeKalb County.

The trend was toward complete absorption by the big city. Against this DeKalb County resisted with all its might, for it was the older place, with traditions of pre-war plantation economy of the deep South. It was a city of beautiful homes in restful grounds, with churches and amusements; a self-sufficient community in all but income. It was not self-supporting.

William Holt Weaver, General Manager of the DeKalb County Water System since 1941, was before that in charge of the Decatur water system. He laid out a plan for an adequate modern water plant to make Decatur independent of Atlanta, but the idea did not take hold. Then Scott Candler, Mayor of Decatur, took up the idea and expanded it to cover the entire county.

At that time the city had an old plant on Peachtree Creek, a tributary of the Chattahoochee River, which often failed to deliver water when it was most needed. Everybody was annoyed, but the idea of building a plant big enough to supply the entire county was too revolutionary. It met determined resistance. The plan to make the city and county one in common ownership was itself startling. But little by little the opposition was won over.

● **WATER made this industrial development possible. DeKalb County is now an industrial and business center, affording employment to thousands of citizens.**

The plan did not include Lithonia, a small community in the southeast corner of the county, because it was already bonded for improvements, and it did not seem wise to assume the additional financial obligation. So for the present that corner is deriving no benefit from the county water system.

Sometime before 1940 the county voted to sell Water Revenue Certificates amounting to $1,000,000. Before they could be sold it was necessary to provide some guarantee, so the county leased the Decatur water system for 30 years, to give the certificates solid backing. For the first plant the outlay was $948,051.49. Other issues of certificates followed. These are retired as they come due from earned profits, which range between $300,000 and $400,000 a year.

The new plant was started in 1942, with a capacity of 8 mgd. This was increased in 1953 and again in 1954. Today it can handle 25 mgd, with a planned overload of 5 mgd in addition. In the beginning it had 4700 customers. On July 1, 1954 it had 31,502 outlets, and served 36,000 families in a population of 140,000—an increase from 13,000 in 1940. Its lines reach 85 percent of the population and 65 percent of the area. At the beginning there were 187 miles of mains; now there are 800 miles. There are 33,000 meters in use, compared with 4750 only 14 years ago, and new ones are being placed at the rate of 500 per month.

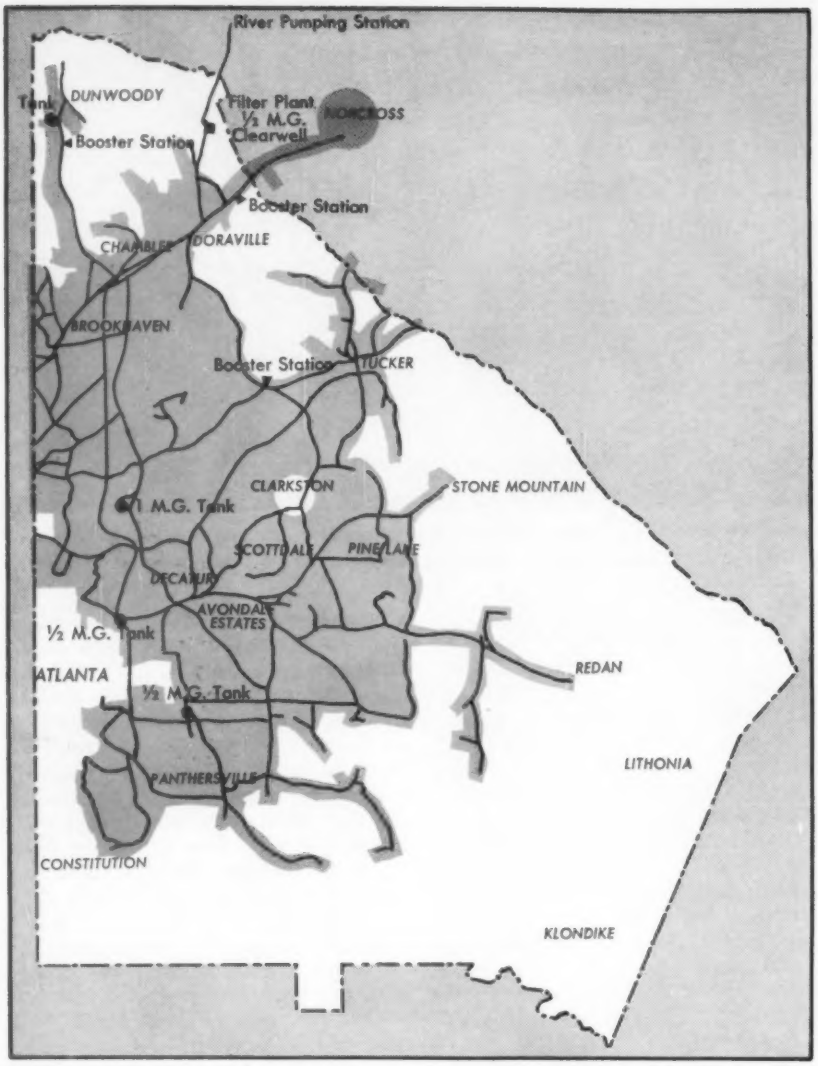
Not all of this building was done with the first issue of certificates. Others followed. In 1940 the WPA contributed $500,000 in labor and materials. Then in 1953 the county spontaneously gave the water system $1,000,000 in General Obligation Bonds. New activity resulting from the county-wide water system had increased tax revenue so much that the county felt it should contribute this money to insure continuing expansion. Taxes were not increased to pay it back.

The cost of the system as it stands is $9,683,000, and it is valued at $23,000,000. Thirty-year certificates have been issued for $7,700,000. The system owes a total of $4,953,000.

One of the by-products of the county-wide water coverage is a county-wide fire department with 9 stations. And a by-product of this is the reduction of fire insurance rates from 90¢ per hundred to 30¢.

Another result is the county sewerage system with 435 miles of mains. About 10,000 of the total 15,408 connections are outside the city of Decatur. The replacement value of this system is estimated at $13,000,000. But only one disposal

● **ADMINISTRATION building, front view. Two additions were made in 1953 and 1954, increasing plant capacity to 25mgd. Second floor provides chemical storage.**



● **WATER lines cover most of the county, serving all but one or two villages.**

plant is operated within the county. Sewage from other sections flows to two disposal plants in Atlanta.

The Water Plant

The river intake station is a substantial brick and concrete structure set well back from the stream channel, protected by rock barriers. To make sure of a supply of water even at low levels, a channel has been blasted out between these natural rock barriers. Water comes to the pumps from the stream-bed.

Three Peerless centrifugal pumps —one 18-mgd, two 8-mgd, and one 16-mgd booster—bring the water through a Link-Belt traveling screen running on a surface about 10 ft. wide. They pump into two lakes. Thirty-Acre Lake, with 30 acres of surface, and impounding 80 mg, was built in 1942 by throwing a stone-faced dam across the outlet of a natural draw. The banks were made uniform by dredging and bull-dozing dirt from the bottom up the sides. Twenty-Acre Lake, with 20 acres of surface, holds 60 mg, and was finished in 1953. It was constructed in the same manner in another draw nearby. The lakes are 2½ miles from the river intake station, and are connected to it by a 30-in. steel main. They are one mile from the water plant, connected by a 30-in. steel supply line.

Raw water from this supply line enters a flash mixer; alum—700 to 800 lbs. per day—is added here, along with chlorine at the rate of 150 lbs. per day.

The settling basin layout is "L" shaped. On the short leg are two units of 6 mgd capacity each, and on the long leg there is one unit of 10 mgd capacity. Each unit has Link-Belt equipped flocculation. From the flocculating chambers the water flows through settling basins, and over weirs into 8 filter units. Activated carbon is added ahead of the filters at the rate of 100 lbs. per day. From the filters the water flows by gravity to a 1½-mg covered concrete clear well which is almost wholly buried.

Lime, at the rate of 600 to 700 lbs. per day, and fluoride at the rate of 6 lbs. per mg, are added to the finished water entering the clear well. The use of ammonia has been discontinued. Omega feeders are used for all chemicals. Infilco controls are used on the filters.

Daily pumpage from the clear well into mains ran as high as 19,472,000 gallons in July 1953, and the low in recent years was 13,156,000 in January 1954. Pumping is done by four 8-mgd Peerless centrifugals powered with Westinghouse motors. The standby is a 4-mgd Peerless driven by a gasoline engine. For storage there is a standpipe holding 310,000 gallons, two elevated tanks of 1 mg capacity, and two others of half that size. A new standpipe to hold 3 mg will be erected in 1954.

As the water comes from the river the turbidity may run as high as 2500 ppm, but the settling in the lakes reduces this to a range from 20 to 250 ppm. The pH of the raw water is 6.7, but this is built up to 8.4 by adding lime at the clear well. The chlorine added to the raw water amounts to 1.2 ppm, and a residue of 0.5 ppm is left in the finished water in the mains.

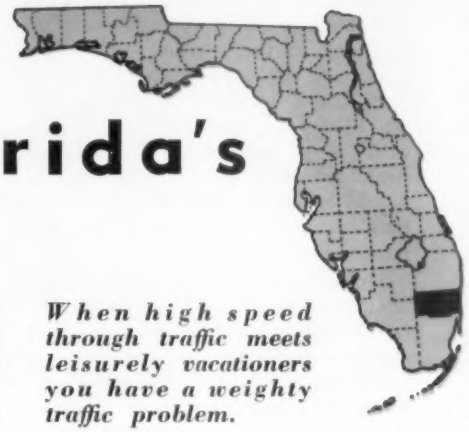
To insure pure water the city health department, in cooperation with the state, collects 18 samples each week from widely separated outlets and tests them in the plant laboratory. They are never taken from the same outlets in two successive weeks. No harmful bacteria has ever been found in a sample. Copies of all reports are sent to the city and state departments.

This was the first plant in Georgia to use fluoridation. It was planned to add fluoride for two months without announcing it, and watch results. Somehow a city official jumped the gun and let the news out at the end of six weeks. No complaint had come in up to that time, but immediately after the announcement the office was flooded with letters and calls complaining about fluoride. In a short time the agitation subsided, and fluoridation is accepted generally. The cost of fluoridation is absorbed in routine operating costs.

One of the good features of this excellent operation is the filing with the consulting engineers, Robert and Company Associates, of Atlanta, as a precaution against loss in a disaster copies of all important papers,

(*Continued on page* 132)

EASING TRAFFIC TROUBLES ON Florida's Gold Coast



When high speed through traffic meets leisurely vacationers you have a weighty traffic problem.

TRAFFIC trouble that surpasses any found elsewhere exists in Broward County, Florida. More than in any other place prosperity depends upon the free flow of cars. It cannot live to itself, for it stands midway of the 100 miles of Atlantic shore called the Gold Coast. The county seat, Ft. Lauderdale, with a population of 52,000 in the summer and 125,000 in the winter, is 45 miles south of West Palm Beach and 25 miles north of Miami.

Other areas have their traffic problems, built up by steady growth and the increase of through-traffic, combined in varying proportions. The common remedy is to carry through-traffic around the city, or through it on freeways. When this is done most cities can take care of their internal difficulties.

Ft. Lauderdale has no such easy solution. It has two distinct streams of traffic crossing at right angles. Local cars go to and from the beaches; east and west. Through cars travel north and south. But the conditions are so snarled that it is not possible to treat local traffic apart from through-traffic.

The dominant factor is that the Gold Coast is a playground. Formerly this was true only for the winter months. Now more and more people are finding that this area is cooler and less humid than many northern sections, and the number of visitors in the hot season increases every year. Practically the entire population of Broward County lives within 7 miles of salt water. It is the beach that draws people and prompts them to settle.

The visitors can scarcely wait to get to their destinations. Every car roars down the highway at top speed, with the driver irritated more and more by the slower traffic. Miami is the terminus. Very few cars continue to the south. Most parties do go to Key West during their stay, but at a vacation gait. Until the rushing cars reach their stopping places they are a dangerous speed hazard.

No Use To Hurry

Once the visitors are established in the innumerable hotels, motor courts and homes they lose all desire to hurry. One more slow driver is added, venting his impatience with the "crazy" speeders on the roads. He will not be hurried for any reason. He is there with his party to loaf, eat, fish and swim. Those who come by train and plane rent cars by the day or season and add to the confusion by drifting idly here and there with utter abandon.

So West Palm Beach, Ft. Lauderdale, Miami, and all the smaller places along the shore must provide for a staggering volume of fast through-traffic, and still keep their streets free enough to make a lazy vacation for those who have settled down. To keep happy the visitors, and the permanent residents as well, must be the prime objective for the cities, counties and the state. The very life of the area depends on it.

Ft. Lauderdale is a marine city. It calls itself "The Venice of America." Back of the ocean is the Intracoastal Waterway. Flowing in from the Everglades is New River, a broad, deep navigable stream. Added to these is the system of canals laid out like streets. A common plan is a checkerboard of streets in the customary fashion, with a canal dredged between the streets where alleys are found in other cities. Each house has a street in front and a wide waterway at the rear.

There are 263 miles of waterway in the city, of which 130 miles are classed as navigable. Water covers 10 percent of the 18.5 square miles of city area. Even the water not classed as navigable is important, and is popular for recreation.

The city is fully aware of the importance of this marine segment of its permanent and seasonal population, and provides every convenience to invite and retain it. Traffic regulations have unique requirements for

● **NOT conducive to a free flow of traffic is this one-lane antique bridge.**

lifting bridges to let boats through, and for parking along the waterways. A municipal yacht basin, Bahia Mar, in a prominent location on the Intracoastal Waterway, has docking space for 300 boats. They can tie up there, connect for telephone, electricity and water from the shore, and remain as long as they wish, paying one dollar per foot of boat length per day.

Besides the wealthy who are able to spend money freely for the best accommodations and all the trimmings, there is a steadily growing body of families who come for the season and take modest quarters to fit their purses. All these live west of the Intracoastal Waterway.

Access to the Beach

For everyone the accent is on the famous beach. It brings all other elements into focus. The climate is the real attraction on the Gold Coast, as in most of Florida, but the beach seems to express climate and all its associations. Everybody has to get there.

Easy, quick access to the beach must be assured, or Ft. Lauderdale and the other communities will not continue to attract the northern public. At present this easy access does not exist. Cars stand bumper to bumper in lines that reach back for blocks, to get across Intracoastal Waterway on the few operating bridges. The bridges are low, so they have to open for very small craft, and the water traffic is heavy. Only one new crossing has been built since 1926, and the population has increased by about 4000 each year. School enrollment rose 22 percent in one recent year.

Traffic counts do not mean much in the opinion of Winston Carlton, District Engineer for the State Road Department. He has all the counties on the Gold Coast in his district, and he has had traffic trouble here for years. He says the area is farther behind in its solution than it was after the war: "We are not solving the problem, but helping it. The problem is too big for present funds. The demand mounts faster than construction."

The state bases its plans and designs on traffic counts averaged over the year. This is general practice, but it doesn't fit a condition such as this one. The actual load is seasonal, and only seasonal plateaus are a fair basis for projecting construction plans into the future. For example, Federal Bridge, carrying U. S. Highway #1 through the city, had a traffic count of 28,000 cars on one day in the winter season five years ago, and a year later the count was 32,000. The average for a year on this bridge would be wholly misleading, and this average would be inadequate for designing. It would be as extreme in one direction as a seasonal peak in the opposite direction.

These are the factors in the problem, the conditions to be met. Ft. Lauderdale, Broward County, and the State are attacking it jointly on both the local and through-traffic fronts. It is a joint project, with all three parties determined to get it finished and end the congestion.

For the local program a bond issue had to be voted. There could be no action other than by the state until the county could provide its part of the funds. Now the bond issue, $6,038,000, is being sold. It is almost entirely for bridges, the key to relief for both local and through-traffic. Ten bridges must be built, 8 of them 4-lane structures, at a total cost of more than $10 million. These bridges will not be small. The reinforced concrete structure over Stranahan River on 17th Street is to be practically 1000 ft. long, with 12 spans of 60 ft. long and a bascule span of 155 ft. These will have two 21-ft. roadways separated by a concrete buffer strip two feet wide, and buffer strips will protect the 5-foot sidewalks from the roadways.

Work can go forward on the six bridges financed by the county bond issue as rapidly as it can be scheduled. The state bridges will be financed by annual appropriations. No start has been announced for any of these four.

All of this work is financed by the 7¢ gasoline tax in Florida. Of this 4¢ goes to the State Road Department for prime projects. The secondary tax is 2¢, and 20 percent of this goes to the counties for their own purposes. The remaining 80 percent is spent in the counties by the SRD on secondary county projects, and the counties can bond

(*Continued on page* 82)

● **GOING to and coming from the beach—a major traffic problem.**

● GUNITE was employed to line old sewers to give extended life.

OIL WELL TRICKS *blend with* SEWER MAINTENANCE

A. J. MAIR

THE annual inspection of Edmonton's trunk sewer system turned up the start of a failure in a 54-inch segment tile storm line this past winter. This in itself was not too alarming, but the problem of repair was complicated by two major factors. Firstly, the line was more than fifty feet below the ground surface, and secondly, it was located on one of Edmonton's busier down town streets. Any disruption of traffic was going to affect not only several trolley bus routes that used the street for a down-town loop, but also the general heavy traffic load that the street carried.

Realizing that any attempt at repair using conventional methods of attack would entail considerable disturbance to traffic, the City Engineering Department decided to borrow some ideas from the oil industry, work them into accepted methods of sewer maintenance, and see if they couldn't evolve a technique for repairing sewers without making a cut from the ground surface.

The nearest existing access to the line was through a manhole approximately 250 feet from the first signs of failure, and the clear diameter of the manhole ring was twenty-two inches. The repair was carried out with no larger access to the line than through this manhole, with very surprising results.

The failure itself took the form of very bad cracks about ten o'clock and two o'clock along the top of the pipe with signs of the tile between these cracks coming in. Fortunately, the failure had been spotted early enough, and about three to four weeks before the first expected spring rain. There were two distinct areas of failure, the first about 50 feet long on the east-west avenue, and the second around a corner on the north-south street, this second break being 70 to 80 feet long.

A check of the original construction records for the line, built in 1929, showed very bad ground conditions at these two points, but no detail of the type of bad ground. The depth of the line being in excess of 50 feet, as previously mentioned, it had been built in tunnel.

First Repair Step

The first step in the repair was to have 24 sets of half-rings rolled at the department shops so that they could be passed down the manhole, set up and bolted together inside the line. The rolled diameter of the rings was kept four inches less than the inside diameter of the pipe to allow for deflection and for 2 by 6 planks to act as shoring between the rings and the tiles. These rings were set up at right angles to the axis of the pipe, and then short lengths of shoring were passed along between the rings and the tiles, starting at the invert of the pipe and working up until, in effect, a wooden pipe had been constructed inside the tile one.

When the first break had been protected in this fashion, short lengths of shoring were removed and pieces of the tile taken out to examine the ground behind the broken tiles. Bore holes were put up through the roof and the results showed a layer of sand along the top of the pipe varying in depths from four to eight feet. Above that, hard blue clay was encountered as far up as the bore holes were driven. The tile had been concreted up to the springing line, hence no failure occurred below that point. It was discovered that the old shoring had been left in place when the tunnel was backfilled and in as many cases as were investigated closely, it appeared that the timbers had partially rotted out, and allowed a concentrated load to come onto the top of the tile pipe at places which coincided with the broken portions of the line.

The general plan of attack was to strengthen the tiles themselves and to stabilize the sand above the pipe to avoid future failures.

A local contractor, Western Gunite Applicators Ltd., applied a 3-inch layer of concrete over a steel mesh covering the arch section of the pipe. The concrete was feathered out below the springing line and trowelled to give a finish as smooth as the original tile. It was felt that the reduction in size of the line at this point was not too serious, although the line is fast approaching capacity flow during heavy runoff periods.

Prior to applying the concrete to the interior of the pipe, 1½-inch steel pipes were pushed up through the tile into the sand, their length varying according to the depth of the sand above the pipe at that point. These pipes were threaded and equipped with standard gate valves and firmly sealed in place by the gunite crew when they fol-

lowed to line the inside of the pipe, as described above.

When the gunited concrete had had sufficient time to set, Halliburton Oil Well Cementing Company was called in to try grouting the sand covering the sewer. Lines of 1½-inch hose were passed down the manhole from Halliburton's grout trucks, coupled to the grouting pipes in place, and a cement slurry was pumped down from street level and into the sand above the strengthened sewer pipe. Although the grouting trucks were capable of tremendous pressures, the average grouting pressure used was between fifty and sixty pounds per square inch, to protect the sewer line itself. Towards the end of the job, a pressure of close to two hundred pounds was built up as a test, and no sign of a break appeared in the reinforced tile pipe. When maximum penetration from one grouting pipe appeared to have been reached, the gate valve was closed, the hose removed and attached to the next pipe in the line.

Grouting pipes had been set in groups of two every ten feet along the portion of the line that had failed, and the slurry was easily forced from one set of pipes ahead to the next.

Another interesting feature of the job arose when the portion of the line on the north south street was repaired in the same fashion. This portion of the line was more than five hundred feet from the original manhole so a smaller hole was bored from ground level, in this case the street pavement, vertically to the line for the express purpose of passing the gunite hose and the grouting hose from the trucks parked on the street down to the men working in the line itself.

A type of drilling rig used locally in seismograph work was obtained, and the hole bored early one Sunday morning. The hole was cased with fire damaged well casing, also obtained from the oil industry.

Fortunately, the manhole and the special access hole were close to the curb of the street and avenue, and the various trucks required for the repair were parked in regular parking meter stalls along the street, with very little inconvenience to the traffic. The repair work was carried out in very short order by a relatively small crew of workmen, and although it is too early to give a positive report on the results of the job, it has gone very well thus far.

Seven-day compression tests on samples of the gunite concrete show compressive strengths up to 5400 psi. The slurry pumped in by the grouting trucks seems to have filled the cells of the segment tile and penetrated the overbearing sand to a certain extent which will be checked later with borings.

The second portion of the repair went more smoothly and much more quickly than the first, and the City of Edmonton feels that this method of repair has very definite possibilities in future repair jobs under similar circumstances.

The effects of the discovery of oil in Alberta are being felt in numerous little ways, such as this, as well as in the more obvious ones.

● **AFTER lining the interior, cement grout was pumped into the soil formations over the line to carry load due to non-removal of original shoring.**

Gold Coast Traffic

(*Continued from page* 80)

themselves for this 80 percent of the 2¢ secondary tax. The "seventh cent" of the state tax is divided into 20 percent to the counties for their own purposes and 80 percent to be spent by the SRD in the counties as they direct. None of the seventh cent may be used for bonds.

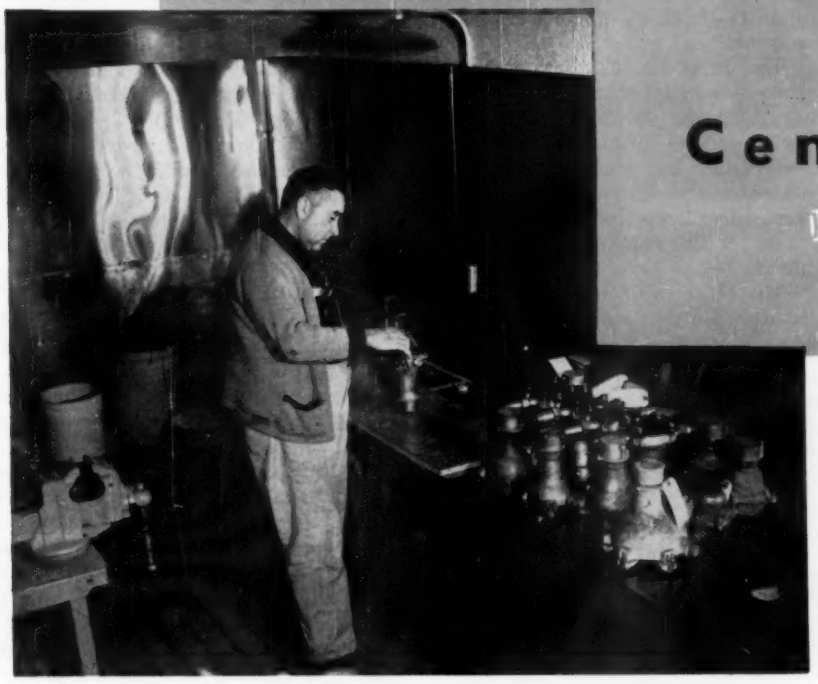
The counties must purchase rights-of-way, and bond money may not be used. Land values are increasing rapidly and approaches will be so costly that the design of bridges may be hampered. The canal system gets into the problem in some cases, as on Las Olas Boulevard. The new bridge for this location may call for major modification of the present layout to get satisfactory approaches.

Another element in the job is scheduling the several projects so as not to make traffic conditions any worse. Where the location is entirely new, as on 17th Street, work can go ahead. Only one other bridge can be started without closing existing structures. To close any of the present bridges before new projects are opened would pyramid congestion beyond endurance. The 17th Street project will not be finished for at least 18 months, so there is no immediate relief. People will have to wait in long lines to get to the beaches for some time. Traffic will not be completely free for nearly five years, when all the bridges will have been opened.

When the program is completed seven streams of local beach traffic will cross the north-south road and the waterways, and another will serve both kinds of traffic. The bridges will be so high that they will not be lifted as often, and being wider they will accommodate more cars, so delays at crossings will be reduced to a minimum. The greater number of roads will thin out the streams of cars.

To other cities, depending on manufactures and distribution for prosperity, it may seem strange to spend $10,000,000 to ease the strain of spending lazy vacations on a beach. Especially when the population, once on the beach, does nothing but lie on the sand talking to each other all day long, indignantly shocked by any suggestion of responsibility or haste. Yet vacationing is the supporting business of the Gold Coast, as soundly as an automobile plant may be the foundation of prosperity elsewhere.

THE WATER METER as a Census Taker



● **PERIODIC testing and repairing of meters are essential for economy and accuracy of readings.**

WATER meter installations are coming to the fore as a valuable means of estimating between-census population growth in communities throughout the country. Reports show that some cities now depend solely on records of new installations of water meters to estimate population increase, while others use those figures in connection with other city statistics. At the same time, water meter and water consumption figures have found their way into official business indices along with such other indicators of trends as bank deposits, building permits, retail sales and employment.

There are several reasons why communities need to keep data on their own day-to-day growth. In many states a given community's share in certain state funds is determined on a per capita basis; cities must keep pace with their needs for various community facilities and must anticipate those of the future; from an economic viewpoint they must be able to point to the city's business advantages; and there is the matter of civic pride.

Community share in state funds poses a problem for some rapidly growing cities. Some states apportion the money on the basis of Federal Census Bureau figures, so under normal conditions the per capita allotment of funds remains the same for a ten-year period until the next census. However, to determine whether it would be of advantage to the city to undertake the expense of a federal special census, normal practice is to estimate population growth prior to filing a request.

Cicero, Ill., is a case in point. The community shares in Illinois state gas tax funds to the extent of $4.76 per person annually. Cicero has grown since the 1950 federal census, but the city is sharing in the tax funds on a basis of the census figures. The town board of trustees decided the population increase appeared large enough to warrant looking into, so it commissioned the city engineers to estimate the extent of growth.

Water meter installations were an important factor in the survey which indicated that Cicero today has approximately 3,000 more residents than it did in 1950. The engineers found that 596 new water meters had been installed in residential dwellings, including multiple family structures. "We have pro-rated the additional meters in accordance with the distribution between one, two, three, four, five and six-family dwellings," the engineer's report stated. "On this basis there is indicated an additional 897 family units."

This figure checked closely with

OMAHA BUSINESS INDICATORS — JUNE, 1954

	June 1954	June 1953	Pct. Chg.	6 Months 1954	6 Months 1953	Pct. Chg.
Bank Clearings ($)	602,737,537	659,481,226	—8.7	3,944,193,904	3,842,005,834	2.7
Bank Debits ($)	685,652,477	641,146,542	14.0	4,020,938,328	3,744,789,236	7.3
Building Permits ($)	3,619,575	1,537,567	135.4	12,252,135	8,366,428	46.4
Electricity Produced (1,000 kwh.)	99,056	98,275	0.8	630,654	531,597	18.6
Water Pumped (1,000 gallons)	1,939,240	1,981,210	—2.1	10,452,770	8,513,530	22.7
Gas Sent Out (MCF)	1,625,848	1,566,134	3.8	12,921,893	10,551,725	22.5
Grain Receipts (bu.)	3,253,160	9,770,212	—66.7	26,985,724	30,064,370	—10.3
Grain Shipments (bu.)	2,968,199	5,361,880	—94.5	23,567,502	28,888,654	—18.5
Postal Receipts ($)	575,955	558,064	3.2	3,528,306	3,324,626	6.1
Livestock Produced (hd.)	287,751	288,736	—1.3	1,848,036	1,819,869	1.5
Livestock Shipped (hd.)	131,612	152,205	—13.5	795,553	822,269	—3.3
Livestock Receipts (hd.)	419,363	440,941	—4.9	2,541,439	2,642,138	—3.9
Cattle and Calves	184,986	208,846	—0.9	1,101,131	1,027,585	7.2
Hogs	166,295	182,556	—8.0	981,980	1,161,330	—15.5
Sheep	68,082	49,539	7.4	458,328	453,223	1.1

	June 1954	May 1954	Pct. Chg.	June 1953	Pct. Chg.
Telephones	131,429	131,267	0.1	127,418	3.1
Toll Calls	283,748	266,796	6.4	274,162	3.4

	May 1954	April 1954	Pct. Chg.	May 1953	Pct. Chg.
Gas Meters	70,686	70,595	0.1	68,647	2.9
Water Meters	70,895	70,605	0.5	68,848	2.9
County Relief Cases	457	533	—15.0	412	10.0
Assistance Cases	4,188	4,653	—10.0	4,642	—9.8

Business Research Bureau — Omaha Chamber of Commerce

● **TYPICAL of the trend to include water consumption and meter installations in business statistics is this monthly report from Omaha's C of C.**

the report of the Illinois Bell Telephone Co., which reported 900 telephones installed, not counting multiple installations for a single family, business or commercial telephones. On a basis of 3½ persons per family, that would indicate a population increase of 3,150.

With the estimated figure of 3,000 population increase, Cicero turned to the problem of the advisability of applying for a special census. The town board of trustees figured it this way. Cost of a special census by the Federal Census Bureau would run about $11,000. If the community gained 3,000 population since 1950, it would be eligible to receive an additional $14,280 annually from the state funds; hence between now and the next regular federal census the town would stand to gain about $90,000 for an investment of $11,000.

Yakima, Wash., this spring took up a similar problem with the State Census Board which determines that city's share in state tax funds which amount to nearly $10 per person. In that case the estimate was determined solely on water meter installations figures with adjustment for dwelling unit vacancies throughout the city.

Independence, Mo., estimates on the basis of water meter installations that 2,400 people have moved to that city and its suburbs annually since 1946. Manager Garvin Dyer of the Missouri Water Company said the average total of water meters in the area rose from 12,888 in 1947 to 17,195 in 1953—an increase of 4,307 during the seven-year period. On the basis of four people to a family, he estimated the population increase during that time at 17,212 or an average of 2,400 a year.

By using its installation figures, the water department is able to break down the population easily between city proper and suburbs, determine the sections which are showing the greatest growth, and generally keep its finger on the pulse of the community's development.

Mr. Dyer projected his estimates to the future, stating that while water meter figures indicate a current population for city and suburbs of 69,000, "it could be conservatively estimated that by the end of the next ten years this area's population will be pushing to the 100,000 mark if the same growth continues."

The Wahpeton, North Dakota, Chamber of Commerce recently estimated its 1954 population as against 1950 in a more elaborate fashion by taking water meters, telephones, electric meters, power customers, employees and employers all into account. In the case of water meters the Chamber took the 1950 population figure and divided it by the number of meters in operation at that time, to find the average number of users per meter. That figure then was multiplied by the number of meters in use in 1954 to get an indicated 1954 population. Repeating the same process for the other five categories, the six indicated 1954 population figures then were averaged to reach a final estimate.

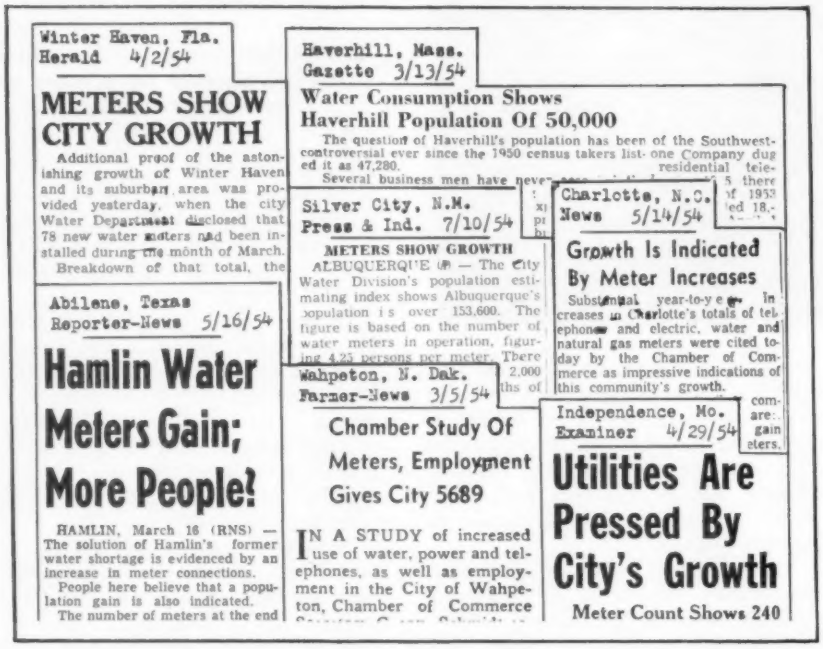
Temple, and Hamlin, Tex., and Pasco, Wash., use water meter connections to estimate current population, but Monte Vista, Calif., in a water company report reversed the procedure. With a population of 8,000 persons and 2,000 water meters in operation the company estimated for future reference that one meter normally serves four people in that community.

Water meters are used to check on real estate trends in Lamesa, Tex., where installations and disconections are used to indicate both where new-comers are settling and where houses become vacant.

The El Centro, Calif, Post, urging passage of local bills for sewer and water improvements as well as a municipal hospital project, cites a 23 percent gain in water meter installations as evidence of the town's rapid growth in the past four years. However, in another California town a tapering off of new installations of water meters brought this comment from a local newspaper: "Put in terms of population growth, it shows that Manhattan is growing more slowly than last year."

Important as water meters are, in determining population growth, the meters are gaining in still another field beyond their basic function of measuring water consumption. More and more cities are listing water meters in use and water consumption in their barometers of business.

The Omaha, Neb., Chamber of Commerce and Sioux Falls, S. D., both include water meters and water consumption along with bank clearings, building permits, livestock receipts and shipments, postal receipts, telephones and other vital factors indicating business trends. Lincoln, Neb.; Memphis, Tenn.; Madison, Wis.; Saginaw, Mich.; Evansville, Ind.; and Council Bluffs, Ia., are among other communities following this trend. The St. Petersburg, Fla., Independent in an article predicting a bright year for local real estate and building in 1954 refers to the Chamber of Commerce business index as indicative of the city's "prosperous state" and adds: "While general consumption of water was down, the increase in water meters by 4,360 is a clear indication of the city's growth in homes.



Winter Haven, Fla. Herald 4/2/54

METERS SHOW CITY GROWTH

Additional proof of the astonishing growth of Winter Haven and its suburban area was provided yesterday, when the city Water Department disclosed that 78 new water meters had been installed during the month of March.

Breakdown of that total, the

Haverhill, Mass. Gazette 3/13/54

Water Consumption Shows Haverhill Population Of 50,000

The question of Haverhill's population has been of the Southwest- controversial ever since the 1950 census takers list- one Company dug ed it as 47,280. residential tele-

Several business men have never

Silver City, N.M. Press & Ind. 7/10/54

METERS SHOW GROWTH

ALBUQUERQUE (AP) — The City Water Division's population estimating index shows Albuquerque's population is over 153,600. The figure is based on the number of water meters in operation, figuring 4.25 persons per meter. There

Charlotte, N.C. News 5/14/54

Growth Is Indicated By Meter Increases

Substantial year-to-year increases in Charlotte's totals of telephones and electric, water and natural gas meters were cited today by the Chamber of Commerce as impressive indications of this community's growth.

Abilene, Texas Reporter-News 5/16/54

Hamlin Water Meters Gain; More People!

HAMLIN, March 16 (RNS) — The solution of Hamlin's former water shortage is evidenced by an increase in meter connections.

People here believe that a population gain is also indicated.

The number of meters at the end

Wahpeton, N. Dak. Farmer-News 3/5/54

Chamber Study Of Meters, Employment Gives City 5689

IN A STUDY of increased use of water, power and telephones, as well as employment in the City of Wahpeton, Chamber of Commerce

Independence, Mo. Examiner 4/29/54

Utilities Are Pressed By City's Growth

Meter Count Shows 240

● **THESE newspaper headlines show the widespread use of water meter installation data to compute population changes and city growth between official census reports.**

Generating Electric Power *from* Waste Incinerator Gases

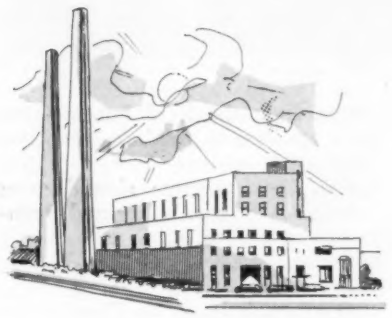
FRANK J. McDEVITT
Pres., Board of Public Service,
St. Louis, Mo.

PRACTICALLY all cities are faced with the need for additional facilities, and frequently the question arises of where to obtain the necessary funds. It is often possible to effect economies which can be converted into cash. Generating electric power from waste incinerator gases, and either using the power or selling it to the local utility is one way of securing a very substantial saving. There is nothing new or complicated about this idea. The iron and steel industry and many others have numerous installations, some of which were inaugurated over forty years ago. In fact heat transfer through an exchanger medium whether it be gas to gas or gas to liquid is today a thriving industry.

The application is not restricted to any particular type of incinerator; there would, however, be certain minor changes in design. Either waste heat boilers using high pressure superheated steam, and a condensing turbo-generator, or a heat exchanger and gas turbine using low pressure filtered air can be used.

The steam turbine was developed around the turn of the century, but the gas turbine, here in this country, is a comparatively recent development. The latter is not yet available in a wide variety of sizes. This handicap is rapidly being overcome however. What installations have been made show a low maintenance cost, together with a high percentage of availability and use factor.

A modern incinerator plant without waste heat recovery would cost from $1,800,000 to $2,000,000 depending on the design and type of



equipment. These figures are based on four 100-ton per day units. If waste heat recovery is included, using either individual steam or air cycle turbines, the added cost would be about $3,500,000, and the power developed approximately 3000 KW per incinerator.

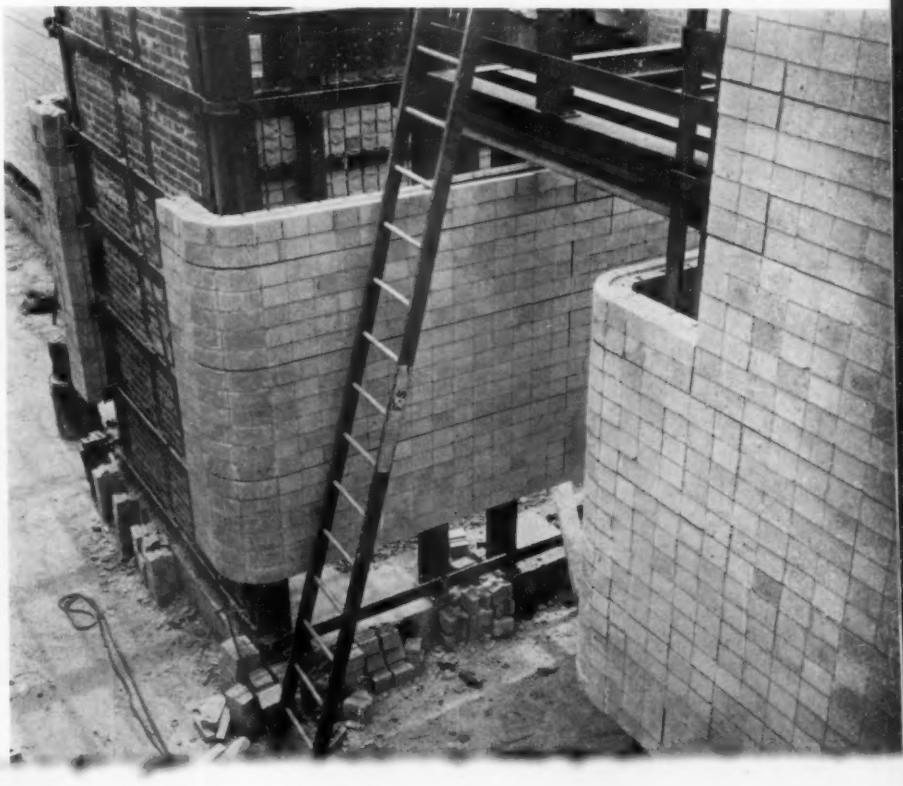
In the steam cycle approximately two-thirds of the heat in each pound of steam at the turbine throttle is lost in the condensing operation. This corresponds with a loss in the air cycle due to compressing a large volume of air to about 75 psig and heating it in a heat exchanger to about 1200°F. With these two principal losses offsetting one another, the air cycle still appears to have the following advantages:

1. Preheated air from the turbine exhaust is available for use under the grates to flash off the high and varying moisture content of the refuse and thereby stabilize combustion.

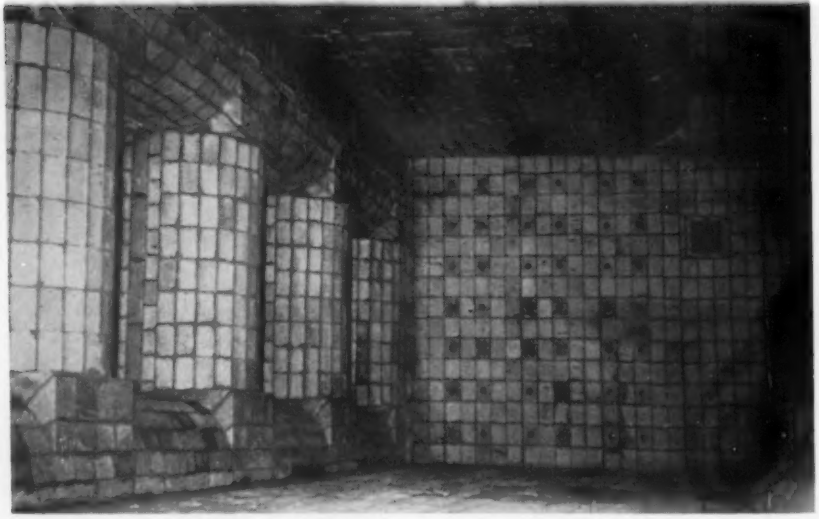
2. Surplus preheated exhaust air under thermostatic controls is available to regulate furnace temperatures, and thereby prevent fusion of fly ash; and also to maintain a uniform temperature at the entrance to the heat exchanger, thus assuring a constant temperature at the air turbine throttle.

3. Fly ash removal is performed mechanically during operation, instead of shutting down each week or two, and removing it manually.

4. Since operation is practically continuous, refractory deterioration due to alternate heating and cooling during shutdown periods for fly ash removal is eliminated.



● **INTERIOR view of one of the furnaces, showing hanging baffle walls mentioned in the article.**



● **REFRACTORY facing used for walls and breeching in the new incinerator.**

5. Boiler room labor, boiler feed pumps, condensate pumps, vacuum equipment, condensers, and circulating pumps, all necessary in the steam cycle, are eliminated.

A carefully prepared heat balance has been checked by a number of reliable sources and it is definitely possible, based on 100 tons per day of combustible refuse having a low heating value of 6000 btu. per pound to develop 3000 KW. This figure is an average of tests made by the St. Louis Municipal Testing Laboratory. Variations in heating values can be expected in other localities particularly with a high moisture content and the inclusion of garbage.

Municipal residential collections of refuse are usually on a five day per week basis and in order to provide continuous plant operations additional commercial collections can be secured over the weekends.

Here in St. Louis we are building an incinerator plant consisting of four 100-ton units. The design was prepared by Greely & Hansen, Consulting Engineers of Chicago. Waste heat recovery is not included. We have made some changes in the original design which should prove beneficial. Flynn & Emrich hydraulically operated stokers have been substituted for hand stoked furnaces. The breeching leading to and between the stacks, instead of solid walls, will have vertical suspended refractory walls with an air space and outer lining of red brick. This change should reduce maintenance costs. A pneumatic fly ash system has been installed for removal of fly ash. This should be an improvement over customary manual removal.

St. Louis is contemplating a substantial bond issue, and among the projects being considered is another incinerator plant consisting of four 100-ton per day units, using waste heat recovery in the generation of electric power. We have a letter of intent from the local Power Company agreeing to purchase the power production at one half cent per KWH. This revenue should gross $500,000 per year. Labor and maintenance costs for power only should not exceed $50,000 per year, leaving a net profit of $450,000 per year. This saving is based on 350-day operation and eight-tenths power factor. If twenty percent more refuse is available from commercial sources and operation is conducted at unity power factor, the return would be substantially greater. Assuming the added cost of generating equipment at $3,500,000, and a net annual revenue of $450,000, the plant can be amortized in about eight years.

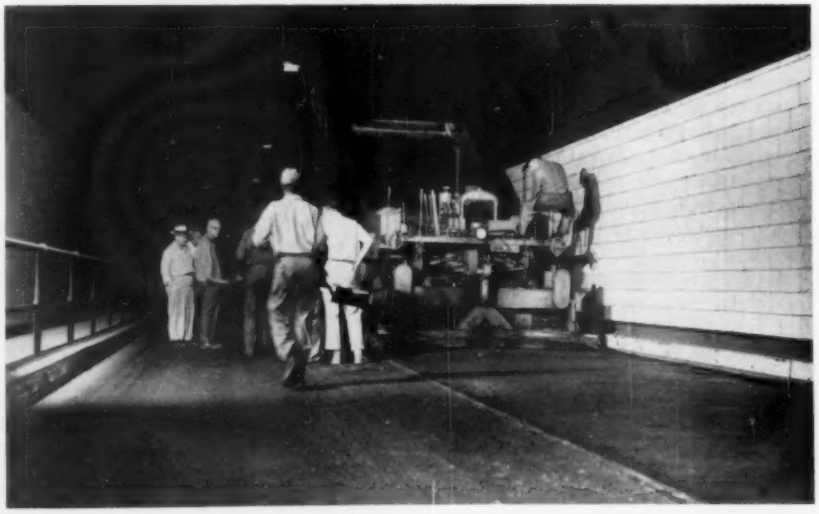
Utility companies are much more liberal today in purchase power produced from waste heat. Based on figures from the Edison Electric Institute using coal at $6.30 per ton, fuel, labor, and maintenance costs, exclusive of any fixed charges, are eight mills per KWH. In the event of war and enemy bombing, utility plants will be a prime target. Incinerator plants would likely be outside the target area, and if equipped to furnish power from waste heat would be very helpful in case of damage to utility plants.

In closing, let me emphasize that whether or not these waste heat recovery plants function properly depends entirely on the installation of suitable automatic controls.

Repaving Heavily Traveled Tubes

RESURFACING of the Liberty Tubes—the point of heaviest traffic concentration in Allegheny County—has been completed. The tubes connect the Pittsburgh South Hills area with the Golden Triangle business district. The traffic tie-up in the inbound tube, the last to be resurfaced, was minimized by completing work during night shifts running from approximately 11 PM to 6 AM.

For this job, the county engineers specified Alabama asphaltic limestone, a fine mix aggregate of up to ⅜-inch size which gives a velvet surface finish. The Harrison Construction Co., Pittsburgh, spread the material with the new Foote Blaw-Knox bituminous paver finisher. The material was laid in two 11-foot widths one inch thick, covering existing concrete previously topped with a 2-inch thickness of Allegheny County D binder asphalt. To pave the two 6,000-foot lanes, 740 tons of Alabama limerock asphalt was used.



Robot Pumping Plant Handles Storm Drainage

DESIGNED to handle the 15-year storm flow from 2,000 acres, the new 34th St. storm water pumping station of Oakland, Calif., has a capacity of 8,000 gallons per second. This is a diesel driven, automatically controlled plant, entirely independent, if necessary, from any outside source of power. The installation is part of a program, costing in excess of $4 million, to provide adequate storm drainage for the West Oakland area, a low section that, in places, is only 18 ins. above highest tide level. A part of the old city was laid out some 85 years ago; scant attention was given in its original layout to proper street and drainage design. The present project is the culmination of efforts started nearly 30 years ago.

Drainage from the area is collected in a series of lines from 24 to 108 ins. in diameter. The latter, the largest pipe ever used for drainage in Oakland, was made by the American Pipe and Construction Co. The 8-ft. sections weigh nearly 2 tons per foot of length. The total flow capacity of the system is estimated at 11,521 gallons per second, of which about one third is discharged by gravity into San Francisco Bay, while the other two-thirds is to be pumped through the plant.

Included in the pump station are four Enterprise DSG-318 diesel engines rated at 1200 hp each at 560 rpm. These drive four Economy mixed flow pumps through Pacific Western right angle vertical gears. These pumps, with a capacity of 250 cfs or about 113,000 gallons per min. each, are said to be the largest of their kind ever manufactured. In addition there are two 10,000 gpm motor driven pumps to handle low flows.

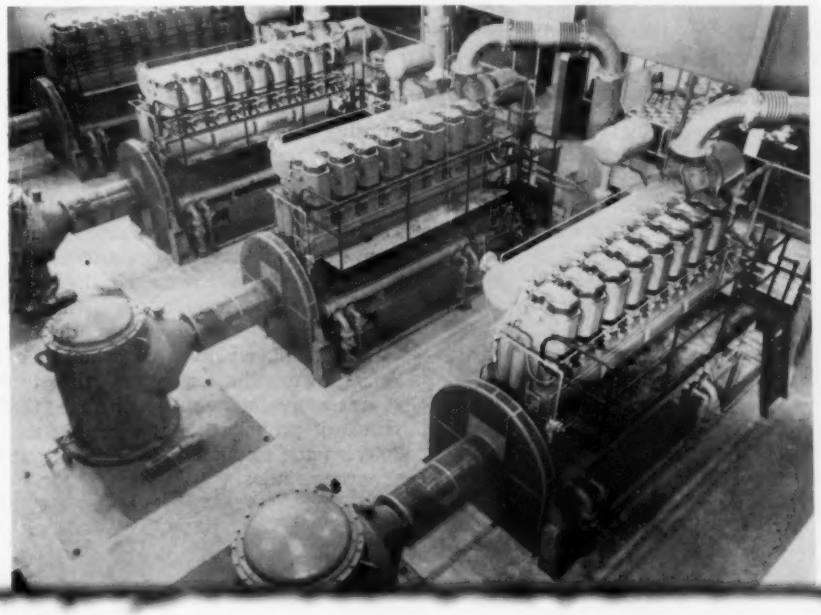
As the water level in the sump rises a float operated Selectrol switch schedules the various pumping units to operate. First the two 10,000 gpm motor driven pumps come on to handle low flows. As the water rises, the electric pumps stop and the first diesel unit starts, idles for two minutes, and then a timer switches it to automatic throttle control. This is a pneumatic float control which translates the water level in the sump to the engine speed control, the speed increasing as the water rises. Should the storm be severe enough that one pump cannot handle the flow, another engine will start, idle, and then increase to the speed called for by the water level. As the sump level rises, the sequence is repeated until all four units are pumping together. This is based on the fifteen-year storm. The engines then go onto a fifteen minute idling period as the water recedes, and if the level stays down, they stop.

The plant is equipped with an auxiliary generator driven by a gasoline engine, so that in case of a power failure, the auxiliary generator set starts automatically and the plant's operation is unaffected. Should the outside water supply be cut off, the pumps will recirculate storm water to cool the diesels. Because of the danger of water hammer in the outfall conduit, each pump is equipped with a sixty-six inch Pratt butterfly valve.

Prelubrication of the engines is accomplished by an auxiliary pump which operates about 2 minutes before the engine starts. Following this, the engine idles for two minutes before taking on the load.

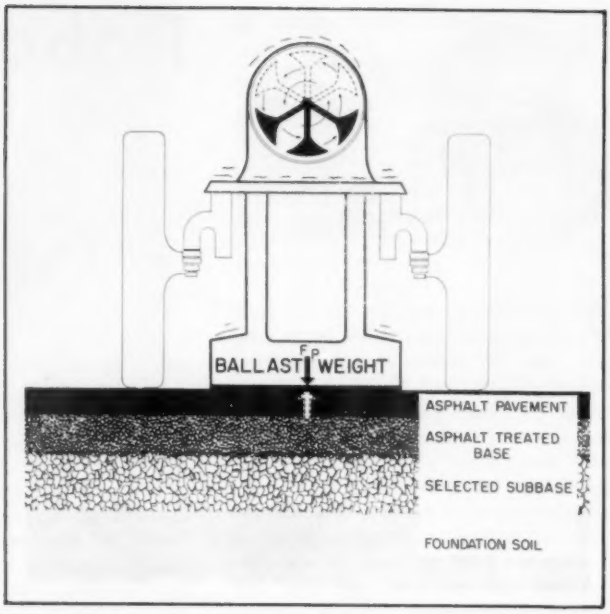
Begun under Charles A. Reed, superintendent of streets, the project is being completed under his successor John A. Morin. Supervising civil engineer in charge of drainage is Sam Weed. Supervising engineer in charge of construction is J. E. McCarty. Guy Anderson of Brown and Caldwell was resident engineer on the job.

The contractor who supplied the four diesel engines, the right angle gears, and the pumps was Enterprise Engine and Machinery Co., a subsidiary of General Metals Corp., with plants both in Oakland and San Francisco. The castings for the four diesel engines were made at the plant in Oakland and completed to operating units in the plant in San Francisco. The contractor for the pumping plant was M & K Corp., San Francisco. The contractors for the storm drain construction were McGuire and Hester, and Solte Inc., both of Oakland, and Stanley H. Koller of Crockett, California. The contractor for the outfall canal dredging project was the Associated Dredging Co. of San Francisco.



● **FOUR diesel engines furnish power for this 8,000-gps automatically operated pumping station.**

● **TRUCK carries measuring and recording instruments; trailer carries engine and equipment for applying loads.**



● **HOW the eccentrically loaded testing unit imparts the loading to the pavement surface, base and subbase.**

BETTER HIGHWAYS PROMISED

by this NEW

ROAD TESTING METHOD

A NEW method of testing the load carrying capacity of bituminous roads, which should lead to better design of highways, was demonstrated recently at the Bureau of Public Roads' Langley Research Station, Virginia. Developed by the Shell Oil Co., this method of testing roads simulates the jarring effects of actual traffic on asphaltic construction and measures these effects in engineering units.

It has the advantage of being nondestructive, requiring no samples or laboratory work and providing immediate, on-the-spot answers. No other testing method, it is claimed, produces such a wide range of simulated traffic conditions or permits such accurate and precise measurements. Movements in pavement as small as one ten-thousandth of an inch can be measured.

The method uses a mobile machine containing eccentrically weighted wheels which impart to the pavement the same effects as are caused by moving automobiles and trucks. The effects, measured and recorded on electronic devices, show how much the pavement is pushed down under the weight of a vehicle, how much of a "bend" there is in the top surface, how far load vibrations travel through the pavement, and its fatigue characteristics.

By this machine, testing of the entire asphaltic road structure, including sub-base and sub-soil layers, in place, is possible, under a wide range of pavement loadings and loading frequencies with accuracy and precision of measurement.

Specific factors measured include: Stiffness, which is a mathematical relation of load and vertical deflection; strain, which is the amount of stretch or shortening in the top surface; velocities, which are the rates of propagation of waves in the pavement foundation; and fatigue characteristics.

The testing procedure employs a machine in a stationary position which simulates the effects of a moving load. The dynamic force is generated by revolving spokes on horizontal shafts with eccentric weights. The loads are imparted to the road through a vertical shaft and base plate which rests on the pavement. By changing the sizes and eccentricities of the weights and the speeds at which the spokes turn, various traffic conditions are reproduced. The effects are observed and measured electronically.

The total force acting on the pavement can be changed from 0 to about 8,000 lbs. The unit load is of the order produced by automobile and truck traffic with tire surface loads of 20 to 80 psi. Loading frequency can be controlled between 5 and 60 cycles per second so that the load is in place about the same length of time as in the passing of a vehicle.

REFUSE COLLECTION SYSTEM USES WET-STRENGTH BAGS

THE garbage can, often condemned as a point of dirt and putrefaction near the home, has been termed the weak link in our sanitation systems. Recent experiments conducted at Hartford, Conn., show the way to significant improvement in garbage collection procedures. The new system involves, basically, the application of packaging for efficient handling through the use of wet-strength paper bags as liners for the cans. This is how it works: The collector takes the filled bag out of the householder's garbage can, leaving the can in place, and replaces the filled bag with a clean new bag. He takes the filled bag and disposes of it in the collection truck. There is no garbage spillage, no odors, no return trip with the heavy metal can, no banging on the sidewalk or against the metal truck. The whole operation is quickly and cleanly performed.

The technology for the construction of wet-strength paper was known but no one had sought to apply this knowledge to the garbage collection field. In the summer of 1953, Union Bag and Paper Corporation at its Hudson Falls, New York, laboratory, designed numerous large wet-strength bags using different types of chemicals and adhesives, varying weights of paper and different bag constructions. These bags were then subjected to severe laboratory and field tests. Bags were filled with cafeteria food wastes and left to stand for periods up to thirty days. Other bags were filled with conventional household refuse. Other tests included the determination of the effect of food acid wastes and resistance to abrasion and abrasive wastes.

In January 1954, field tests were conducted with 6,000 garbage bags. The field tests proved that the bags stood up under all types of refuse, severe cold and heavy rain without failure.

As a result of field tests, certain modifications were made in the specifications for bags. Thus, for the Hartford tests, the first large scale practical application, the bags are designed to be just slightly smaller than the cans into which they are placed. This is to prevent any possibility of binding. Originally it had been felt that the can would be required to support the contents of the bag under pressure. Now it is known that the construction of the bags is strong enough to support the contents indefinitely without assistance from the can. During the Hartford tests, it was found that the average refuse load is less than 25 pounds. The new refuse bags, made of resin treated Kraft paper, hold 80 pounds when dry and 40 pounds when the bags are wet.

Economies in the Use of Bags

Substantial economies may be available through the use of wet-strength garbage bags. The extent of such economies naturally depends on the collection practice in any given situation.

There are several bases of savings, as follows: 1) The collector does not have to make return trips from the truck to replace empty containers; 2) The collector can carry by hand or transport by hand truck twice as many bags as cans, thus doubling his productivity on each pick-up; 3) With spillage eliminated no clean-up time is needed; and 4) The use of bags eliminates the time and extra costs associated with burlap sheeting or other lightweight receptacles for intermediate carrying, where this method had been used.

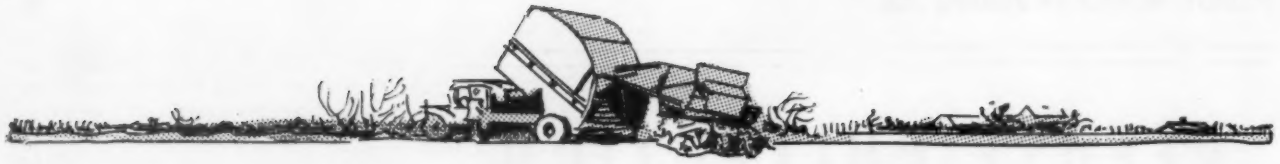
From the standpoint of truck operations there is no change from the present method. Tests indicate that the weight of the bags is 2 percent or less than the weight of the average contents; thus there is no significant increase in the weight of the loads picked up. Man-hours required for the actual pick-up of refuse during collection rounds may be substantially reduced.

Results of Tests

Substantial evidence gained through tests made under field conditions shows that the use of wet-strength paper bags results in a number of advantages. Sanitary conditions at the collection point are vastly improved. Spillage of refuse is virtually eliminated. The collector's job is made more efficient by relieving him of the shaking-out operation, reducing the weight of loads to be carried and eliminating the return of empties from the collection cycle. And finally, the householder finds that garbage collection is made cleaner and more noiseless while the cans are kept sanitary and free from damage.

The Hartford tests were made under the direction of Carleton F. Sharpe, City Manager. Other city officials participating directly in the test program are Charles W. Cooke, Director of the Department of Public Works and Holbrooke Bourne, head of the Division of Sanitation. J. Henry L. Giles, Sanitation Engineer for the Public Works department has been in charge of the field work.

● NO CANS to handle; no noise in the street with new wet-strength bags.



IS SANITARY LANDFILL RIGHT FOR YOUR COMMUNITY?

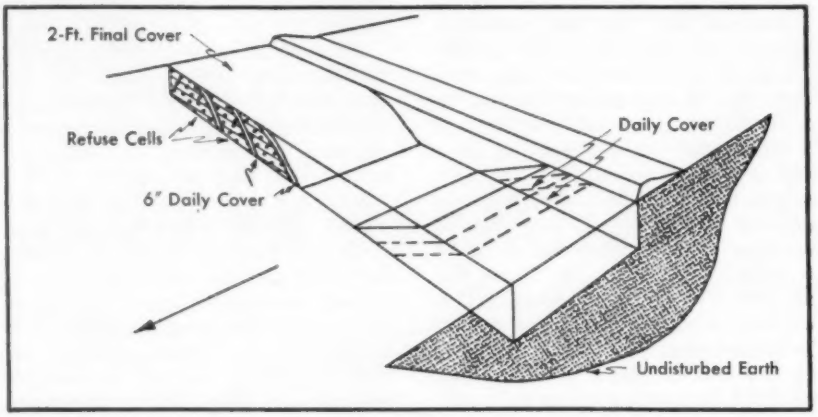
JOSEPH E. SKORNICKA
Sales Development Division
Caterpillar Tractor Co.
Peoria, Ill.

This is an abstract of a paper by Mr. Skornicka before the recent Western Canada Water and Sewage Conference.

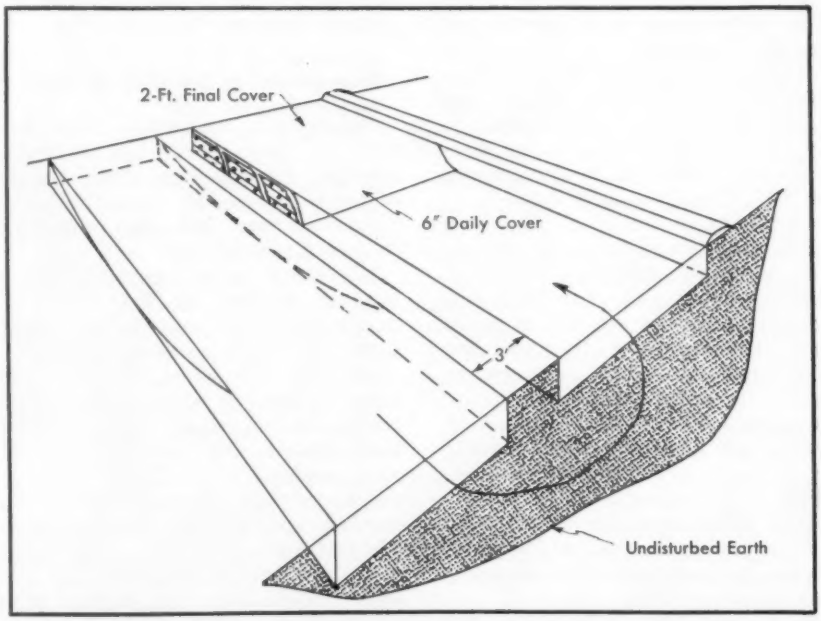
WE CAN DISCUSS at length the various factors of cost and equipment but the basic consideration for the city official is the "how" of the matter. What type of landfill is best suited for a particular community after having obtained certain facts?

There is no magic formula, no absolute equation that will produce the answer; rather a common-sense, down-to-earth analysis of a community's needs is necessary. The following are basic considerations in the selection of a method of operation: (1) Population and refuse production; (2) type of refuse —private and industrial waste; (3) available land; (4) type of soil; (5) topography; and (6) equipment preference. Over many years of participation and promotion of this market, one point has been brought out time and time again. That is; there are many methods of operation, likewise many different types of equipment are required. Where a tractor-shovel may do an excellent job for one community, a tractor-dozer-scraper combination will do the best for another. Several methods of operation are clear-cut and well-defined.

The progressive single trench method is often referred to as the "cut-as-you-go" type of landfill. Here, the working trench area is kept to a minimum. Only a small portion of trench is dug previous to being used. As a day's amount of



● **PROGRESSIVE single trench method concentrates activity in a minimum area. As refuse is dumped from the side it is spread and compacted and each day's accumulation sealed into a cell by a 6" cover. A final 2-ft. cover is placed on top. Earth cover is excavated from adjacent areas as trench is extended, reducing haul.**



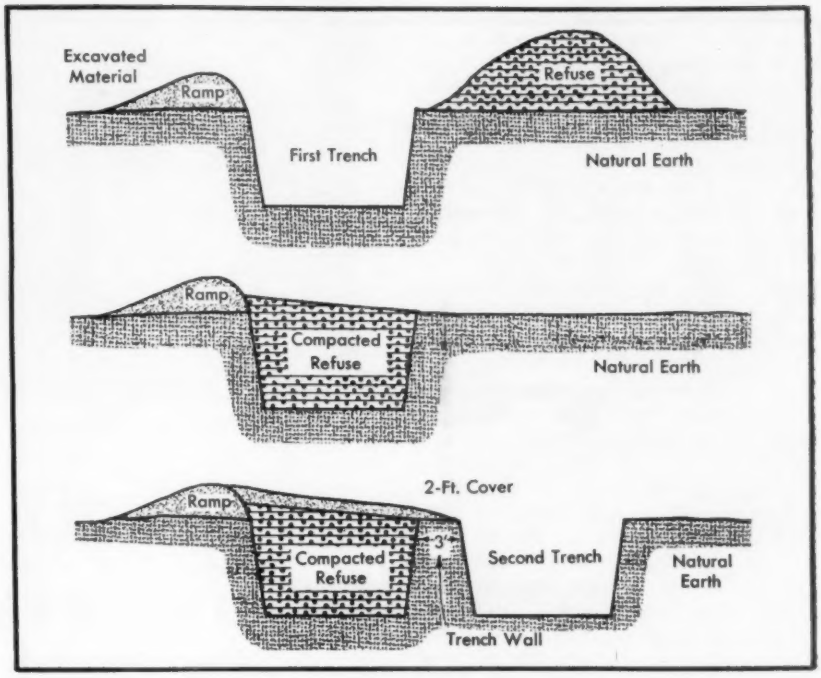
● **DUAL TRENCH method uses cover material obtained from a second trench parallel to the first. Excess material may be used for fill elsewhere or for leveling the site. Completed open trench allows for large daily variations in refuse production.**

refuse is placed on the working face and thoroughly compacted, one cell is formed. After all hauling units have reported in, cover material is obtained by progressively lengthening the trench. This means that the tractor need not spend a long period of time preparing a site. This work can be done in two to four hours depending upon the ability of the equipment operator.

This method of operation is commonly used by communities up to 18,000 population. The trench dimensions are usually six feet in depth, 18 to 24 feet wide and just as long as the landfill site permits. The daily cover should be about 6 inches in depth with a final 2-foot cover on top as the trench progresses. For such an operation, either a tractor shovel or bulldozer can be used. Once the trench has been started, no actual carrying ability is required. What then determines whether a dozer or shovel is required? First, for the smaller community, landfill is not an 8-hour per day operation. One city may wish to have a unit available part time for loading trucks or for snow removal. That town should use a shovel. Another community may wish to perform construction work requiring a land leveling machine. It should purchase a dozer.

The dual-trench method is excellent for communities in the 18,000 to 40,000 classification for several reasons. First, the method uses a completed trench which is large enough to permit daily variations in refuse production. This trench is generally 24 to 35 feet in width, 6 to 8 feet in depth and from 200 to 600 feet long. As a day's cell of refuse is completed and compacted, cover material is obtained by digging a second trench adjacent to the first. As the first trench is completed, the second trench is nearly excavated and requires little work to complete. Since there always will be an excess of cover material, it is often used by the city for fill material or in establishing a smooth grade over the completed site. What type of equipment will do the best job here? The unit most generally used is the front-end shovel since cover material must be carried. Again, the shovel is a most versatile machine and can perform other jobs when not on the fill.

Gully or low ground method is one of the various area methods of sanitary landfill. The area method is most flexible. No trenches are prepared, no hard and fast rules apply. Each site has different characteristics. For example, a typical area-type operation, referred to as the gully or low ground method, has a low area surrounded by high banks. The low area must be isolated, not a waterway during spring thaw or rainy weather. In operation the area is progressively filled and covered with material dozed downhill from the high banks. This is an operation for the larger community with a large volume of refuse. Such a method requires that an adequate layer of refuse be placed on the fill. Where the smaller community wishes to fill in gullies, a modified cell method is used which will accommodate the community with smaller refuse production. There are, in many cities, large area-type sanitary landfills using low but level land.



● **STEPS in construction of a sanitary fill on the site of an old refuse dump. Old refuse is bulldozed to one side and later placed in the first trench where it is compacted and covered. Normal sanitary fill operations follow on cleared site.**

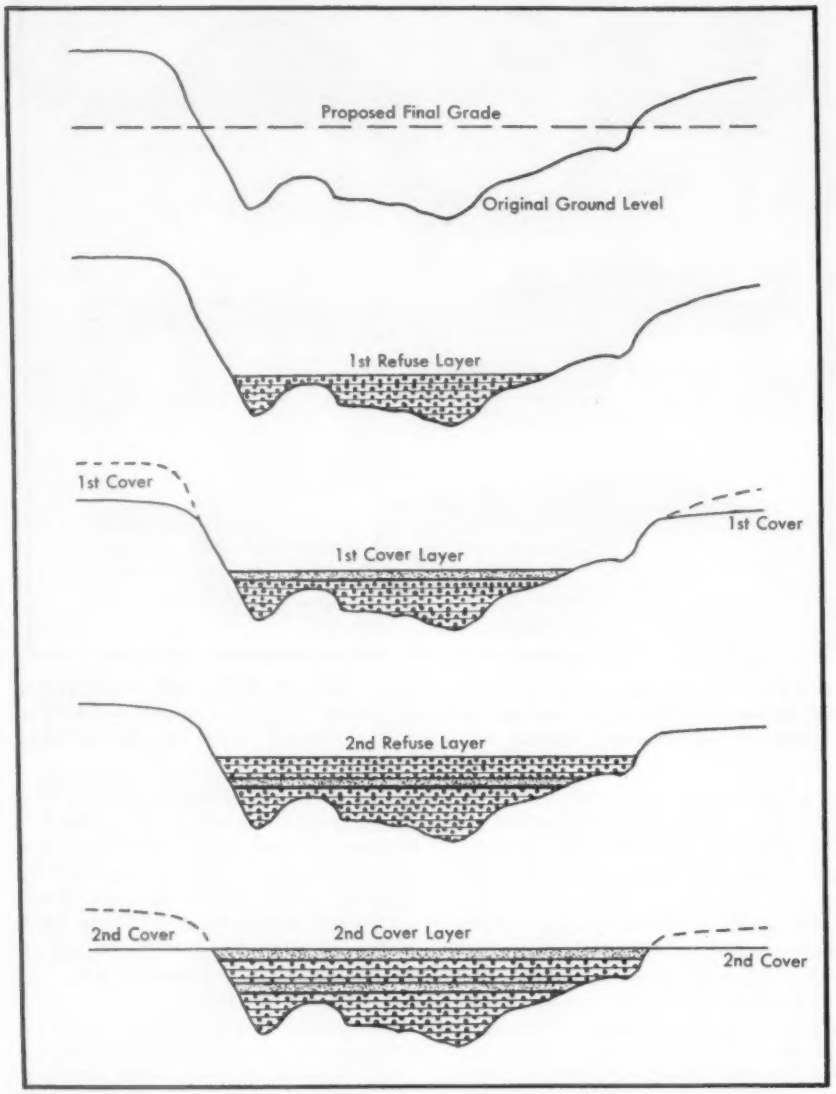
Preparing open dumps for landfill operations: There are, generally speaking, two types of open dumping, area and hillside. The first type, area dumping, is no more than a spot where garbage and trash are dumped over a flat area. Because of the design of hauling units, refuse is rarely more than five feet deep. Land is used up rapidly and new sites must be found.

For the small community this is a common cancer which can be cured without much difficulty. First, the refuse is pushed to one end of the property and piled in a windrow. The tractor then excavates a trench adjacent to the refuse windrow. The next step is to push in the refuse by stages, compacting thoroughly each time. The final step involves merely pushing over the cover of clean earth and compacting it. These four steps rid the community of years of dumping and make an area fit for sanitary landfill.

The hillside dump consists merely of dumping over a hill into a lower area. Most of us have, from time to time, seen these areas with fires so deeply imbedded as to make extinguishing impossible, areas where vermin and flies not only feed but multiply undisturbed.

The condition of the hillside dump and the volume of refuse requires that all material first be compacted as much as possible. It should be understood that the refuse at the bottom of the dump can never be thoroughly compacted unless it is cut down and rehandled. This would involve several pieces of the largest equipment available and this is probably both impractical and too expensive for the smaller communities. Cover material is obtained from the area immediately in front of the refuse cell. The following cells of refuse are then constructed in the same manner. However, refuse is now compacted as it arrives and forms a more solid mass than did the first cell.

The municipal official should consider many factors beyond the



● **GULLY is leveled with successive layers of compacted fill and cover material.**

technical and machinery application.

Is Sanitary Landfill considered an acceptable method? Although sanitary landfill was accepted as both safe and sanitary many years ago, initial citizen resistance and prejudice must sometimes be overcome. This is due mostly to the fact that "landfill" and "Sanitary Landfill" are terms too often interchanged, yet are often quite contrasting. We must then educate (and sell) the public on sanitary landfill practices.

How can one gain public acceptance? The problem more specifically boils down to neighborhood acceptance, that is, any group within sight of the landfill site. The solution is to make clear the difference and desirability of sanitary landfill as opposed to the open dump.

One of the means of approaching the problem is to inform the public through radio and newspaper. If necessary, an open hearing with the city council should be arranged. Perhaps, a public demonstration with an equipment manufacturer can be arranged. The best, of course, would be to visit a good sanitary landfill site that has been in operation for some time.

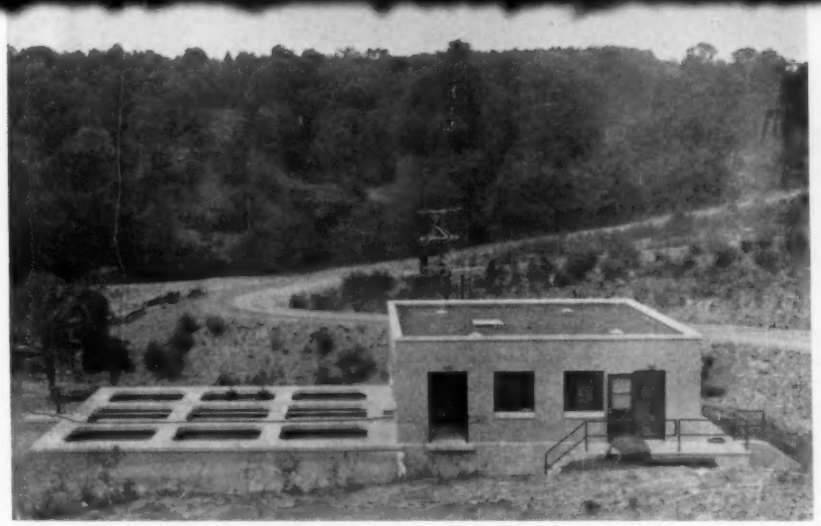
How will Sanitary Landfill compare with other methods? Economics is the one point of comparison. Where suitable land is available and other conditions reasonable, the sanitary landfill is an economical method. Such items as personnel requirements, knowledge of various methods of operation, and operating problems should be considered. An advantage of the sanitary landfill is that it can operate at one site today and yet be able to start a satisfactory operation elsewhere the next day. This appeals to the community that wishes to fill in low submarginal land but cannot during the high water season. It should be emphasized that successful sanitary landfill operation must have two things: dependable equipment and competent supervision. In sanitary landfill, the operation is a day-to-day procedure. Any relaxation of this rule spells failure. The smaller community can find other uses for the equipment to justify the expenditure. No more than four hours per day should be required for operation.

How do personnel affect operation? Training of the attendant and/or operator is most important. A knowledge of good tractor operation, an overall plan, and correct landfill operation are essential. A man may be a good operator and know how to manipulate a tractor, but this alone does not guarantee good landfill operation. He must be able to visualize the area when it is completed so natural drainage is formed. He must know compaction and cover techniques. In smaller communities where he is in charge, he must direct all dumping according to a preconceived plan.

How does sanitary landfill fit into your community's needs? For a community with a pressing problem, landfill offers a speedy cure. All that is physically required is a tractor, an operator and land. For the smaller community no extensive engineering study is required. Property chosen for landfill should permit, if possible, five years of operation. Some larger communities with little available land, must consider sanitary landfill as a series of relatively short-term plans.

Can your community finance Sanitary Landfill? It is not our purpose to discuss methods of financing, but rather to point out that a relatively low initial capital investment is required. As an example a properly equipped tractor can be purchased for less than $7,000. Land purchase must also be included in the initial investment. This is often no problem as most communities own property. For the small community, guaranteed used equipment may be the answer.

In conclusion, it is obvious that initiating a sanitary landfill project involves more than dumping, compacting and covering of refuse. It requires preliminary planning, public education and acceptance, correct supervision and operation and follow-through. The observance of the basic considerations will spell success for your community, economical disposal with limitless possibilities for reclamation and expansion.



● VIEW of Hartsville plant showing the sedimentation basins at the left.

MODERN
WATER TREATMENT PLANT
for a
SMALL COMMUNITY

J. WILEY FINNEY JR.,
Associate, Howard K. Bell,
Consulting Engineers,
Lexington, Kentucky

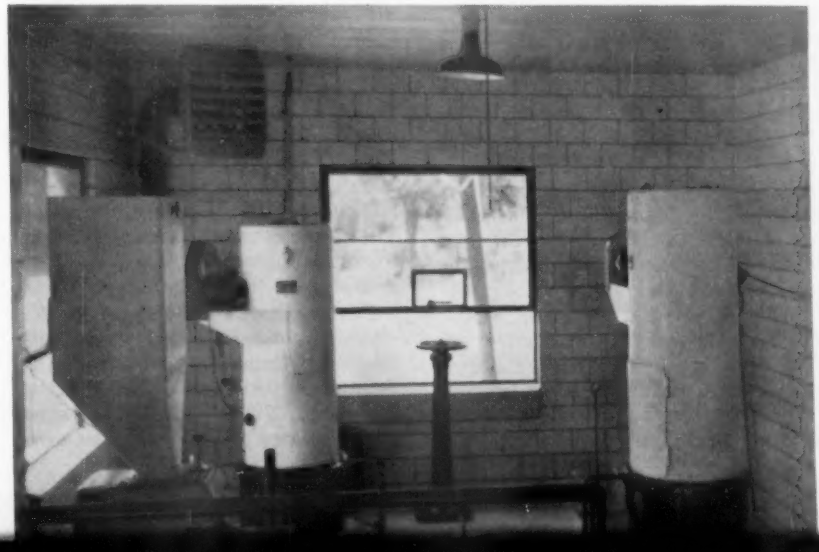
WATER shortages in Hartsville, Tenn., have occurred ever since 1936; but in 1953, the lack of water became so acute that it was necessary to resort, for a short time, to an emergency supply from Little Goose Creek. This was treated by filtration through portable filters and by chlorination. After such experiences, Grover Lentz, Water Works Superintendent of Hartsville breathed easier after the new filtration plant was put into operation last August. This plant has a capacity of 357,000 gallons per day and is an excellent illustration of a modern installation for a small community.

Realizing the need for planning and construction of new water supply facilities city officials, headed by Mayor T. P. Thompson, contracted in August, 1952, with Howard K. Bell, Consulting Engineers, for a preliminary engineering report on needed water works improvements. After study of the engineering report, the engineers were authorized to proceed with final plans and specifications. Bids on the project, including the river intake, treatment plant and main extensions, were opened in August, 1953. Arrangements for financing were completed and contractors began work in November, 1953.

The engineering study showed that the most desirable adequate source of supply was the Cumberland River and a plant site about one mile from town on the Hartsville-Lebanon Road on a bluff overlooking the river was selected. The fact that the proposed impoundment of the Cumberland River by the Old Hickory Dam would raise the pool level by about 23 feet both simplified and complicated the design of the intake structure in that the plant would be completed and placed in operation while the river was at the lower stage; and later, after full impoundment, it would be desirable to take water from a higher elevation. The construction of the intake works prior to raising the water level allowed a major portion of this construction to be done above the existing water level. A circular concrete wet well intake structure was designed with three valved inlets, one below the present water level and two higher inlets spaced to give a selection of intake level after full impoundment of the river. Removable trash screens and a back flushing arrangement are incorporated in the design. Two vertical turbine pumps with weatherproof motors are mounted in the open on top of the wet well at an elevation five feet above the anticipated high water level. These pumps have a capacity of 250 gallons per minute each and are operated individually to supply the rated plant capacity.

Raw water is delivered to a two-story quick mix and coagulation basin directly under the chemical feed room at the plant. Agitation is provided by paddles driven by a Pelton wheel arrangement receiving power from the velocity of the incoming water. The quick-mix compartment is directly over the coagulation chamber and the mixing of the chemicals with the water is facilitated by a small motor driven agitator. After nine minutes detention in the quick-mix compartment the water passes through the floor of the upper section into the coagulation basin where flocculation is continued for a period of 27 minutes at the plant rate of 250 gallons per minute. Omega chemical feeders are provided to apply alum, lime and

● CHEMICAL feeders; mixing and flocculation basins underneath.



● **RIVER intake and pumping station has inlets at three levels.**

carbon to the water. Lime may be added into the quick-mix basin or to the coagulated water entering the sedimentation basin. Carbon can be applied in the quick-mix or to the water going on to the filters.

Settling and Filtration

The sedimentation basin utilizes a down and up flow principle in which the water enters the basin from a central V-notch weir trough extending the length of the basin. Flow is downward toward each side, directed by a sloping baffle on each side of the inlet trough. After passing under the baffles the water rises to the two collection troughs extending the length of the basin near each side, and is piped to the filters. An interesting feature of the sedimentation basin is the construction to permit frequent removal of sludge without taking the plant out of service for an extended period of time. The bottom consists of a series of hoppers in the shape of inverted pyramids. These hoppers, seventy-two in number, are connected to a manifold and laterals drainage system so that by opening one valve the sludge may be flushed from the hoppers by the hydrostatic pressure of the water in the basin.

The two filters are of the conventional rapid sand gravity type in which the sand bed is supported on porous plate underdrains. The porous plates are supported by concrete piers and grooves in the filter walls and are anchored against uplift by Everdur bolts and washers. Wash water troughs are constructed of aluminum plate to reduce maintenance cost. A surface wash system in each filter is provided by means of a perforated wrought iron pipe grid with the centerline of the pipes two inches above the sand surface. Filter backwashing is from a 23,000-gallon storage tank located on the hillside above the plant. The tank contains sufficient water for a normal backwash of both filter units.

The rate of flow from each filter is controlled by means of a float valve which maintains a constant head on an orifice located in a glass covered orifice tank. A sight well on the operating floor allows the operator a visual inspection of the clarity of water in each orifice tank. Each of the duplicate orifice tanks discharges to a pump suction chamber affording submergence for two vertical turbine high-lift pumps. This chamber also serves as a point of application for post chlorination.

The operator's office and laboratory are on the operating floor which also provides space for electrical control panels and a gauge panel. Motors and discharge connections for the duplicate high-lift pumps are also located here. All pressure piping is contained in grill covered pipe trenches and no pressure piping is located under concrete floor.

There is a toilet room on the operating floor level; a chemical storage room on the same level is located adjacent to the chemical feed room and has an outside loading door and platform. Interior walls are finished in glazed tile which lends a pleasing appearance and is readily cleaned.

Chlorine equipment is housed in a separate room with openings only to the exterior of the plant and the room is provided with an exhaust fan. The equipment is visible from the operating floor through a fixed glass window in the partition wall. Chlorine scales are set in a sunken platform for ease in mounting the cylinders. Chlorine feed equipment for prechlorination is a Builders-Providence type DVSX-M machine and for post chlorination a Wallace and Tiernan type MSVC machine.

Water pumped from the plant is metered through a four-inch turbine meter and water used in the plant is measured by a two-inch disc meter on the plant service line. Both units were furnished by the Pittsburgh Meter Division of the Rockwell Manufacturing Company. The vertical turbine pumps for low-lift and high-lift installations are Peerless.

The contractor for the intake and water treatment plant was Bush Building Company, of Nashville, Tennessee; Abbott & Ritchie, of Richmond, Virginia, was Contractor on the water supply main to town and the main extensions. Officials of Hartsville responsible for this major municipal improvement are: T. P. Thompson, Mayor; J. W. Vance, Commissioner of Police and Streets; Gayle Gregory, Commissioner of Public Utilities; J. U. Crenshaw, City Clerk; Grover Lentz, Superintendent of Water Works; Edwin Reese, Chairman of the Water Board; Alexander Gwin, City Judge and Member of Water Board; E. D. Freedle, Member of Water Board.

The contract price for the river intake, pumps and treatment plant was $119,470 but savings made during construction will reduce the actual cost to about $115,000.

• • •

Modernizing Chicago's Loop Pavements

IN repairing the surfacing of Jackson Boulevard, in Chicago, Arcole Midwest, the contractor, used a new piece of equipment to remove the old blacktop. A hydraulically controlled ripper on the rear of the HD-15GC Allis-Chalmers tractor stripped the old bituminous surfacing from Dearborn to Wells St., in 5 working hours. The loose material was picked up and loaded into trucks by two HD-9G tractors with TS-9 Tracto-Shovel loaders. These worked as a team forcing material into each other's buckets.

On this job there were thousands of superintendents — some even located on the tops of the surrounding skyscrapers.

DETERGENTS:

PART II

THE EFFECT OF DETERGENT-CONTAINING WASTES ON BIOLOGICAL FORMS AND WATER USES

The marked increase in both domestic and industrial use of detergents has brought new problems to the sanitary engineer concerned with waste treatment and with purification of waters containing untreated detergent materials. In the first of two articles Prof. Gloyna discussed the types of detergents found in sewage and industrial wastes. This part covers their effects on waste treatment processes and water supplies.

EARNEST F. GLOYNA,
Associate Professor,
The University of Texas

SURFACE depressing, washing, complexing, chelating and oxidizing agents used in household and industrial laundries, laboratories and industrial processes frequently combine with liquid streams to produce a waste effluent of considerable complexity. Various types of detergents containing a variety of builders are being produced and used and indications are that the numbers and types of synthetic detergents marketed will continue to increase. Additional problems may be expected in treating wastes containing detergents, for synthetic detergent consumption has by no means reached a peak.

Detergents in general have a high biochemical oxygen demand and frequently are toxic to biological forms. Most of the detergents are not easily removed by sewage treatment processes, and it has been estimated that half or more of the active matter passes through a sewage treatment plant. Yet, in some areas, such as the arid southwestern part of the United States, all liquid wastes eventually must yield to treatment. In these areas, a short, cyclic path of drinking water to waste water and back to drinking water or process water is not uncommon. Listed among those detergents that do not readily yield to treatment are some of the modern non-ionic detergents. These compounds are relatively immune to biological breakdown and will precipitate only under conditions which would make water and waste treatment economically prohibitive.

Early English investigators found that lime was satisfactory in precipitating part of the soap in laundry wastes.[1] These analyses led to investigation of chemical precipitation as an adjunct to ordinary sewage treatment. In 1928, Sakers and Zimmerman, in their chemical precipitation experiments, devised an iron and lime formula that produced an acceptable floc.[2] However, when they tried secondary treatment with a Cunningham filter, considerable clogging occurred.

Research by Boyer[4] in 1934 disclosed that trickling filters were satisfactory for handling laundry wastes. Chemical treatment of wastes, although producing a good effluent, was found economically impractical. Chemical precipitation with 3.5 pounds of ferric chloride or ferric sulphate per 1000 gallons of waste resulted in 85 to 90 percent reduction in 5-day BOD. A trickling filter removed turbidity, neutralized almost all of the caustic alkalinity, reduced the grease content from 367 to 35 ppm, and reduced the 5-day BOD 72 percent.

More recent chemical studies made in 1942 by Snell and Fain[5] showed that 360 ppm of aluminum sulfate and 144 ppm of sulfuric acid gave substantial clarification. Gehm[6],[7] pointed out that the biological oxidation of soap for equal BOD loadings was about the same as domestic sewage. Soap required about twice its weight in oxygen before a satisfactory 5-day BOD value was obtained. Gehm also found that the laundry waste could be coagulated with carbon dioxide or sulfuric acid at a pH of about 3.0. In this connection, he tried sea water with small traces of lime and found that it produced a rapid settling floc which formed a compact sludge.

Another process, called "Vacuum Flotation", was introduced during the last decade.[8, 9] This has been used to remove grease and light difficult-to-settle solids from sewage prior to clarification. The process involves aeration of sewage for 30 seconds with 0.025-0.050 cubic foot of air per gallon. The aeration period was followed by the application of a vacuum. It was claimed that chemical coagulation induced flotation instead of precipitation, particularly if carbonates were present in large amounts. The flotation apparently was due to the release of carbon dioxide, and carbon dioxide was formed as a result of lowering the pH.

Some of the more recent patents covering the treatment of laundry wastes claim the hydrolyzation of soap. Soap can be hydrolyzed with hydrochloric acid. Upon hydrolyzation, the solution may be passed through a filter which has been charged with an oxide such as hydrous ferric oxide, zinc oxide or stannic oxide.[10] The fatty acid-free solution is finally passed through a chlorinated coal filter where the remaining organic matter is removed.

Considerable information on laundry waste treatment also has been obtained through the efforts of the Atomic Energy Commission research groups. Basic investigations involving the concentration of radioactive particles from laundry waste water has produced much valuable information regarding the effects of laundering aids on biological and chemical treatment processes. The Los Alamos Research Group and the

Public Health Service employed various methods in the decontamination of laundry wastes. Modified treatment methods included chemical precipitation, biological processes, such as activated sludge and trickling filters, and combinations of other water and sewage treatment practices.[11, 12] Laundering aids used at Los Alamos included such materials as inexpensive yellow soap, synthetic detergents, ammonium citrate, and scouring compositions which included ammonium fluosilicate and occasionally some phosphates. Biological oxidation of complex synthetic laundry wastes containing one or more laundering aids and synthetic nutrient also were investigated.[13] The synthetic nutrient was comparable to an average domestic sewage in that it contained all the essential components for biological growth and was chemically similar to domestic sewage, but was free of the unaccountable foreign matter found in sewage. Some of the contaminants investigated were citrate, Versene, Igepal, Rinso and Tide. Rotary tubes and trickling filters were used to study the development of surface slimes while agitated flasks were used to investigate the toxic properties of various laundering aids.

Effects On Waste Treatment

A variety of opinions exists on the effects of laundry wastes, particularly detergents, on sewage treatment plants. Rudolfs, Manganelli and Gellman[14], on the basis of laboratory experiments, concluded that the principal effects of detergents were decreased efficiency of settling tanks; foaming, floc agglomeration, and carry-over in activated sludge units; and reduction in gas production from sludge digestion. Jepson[15] claimed that the problem created by the presence of detergents in sewage was serious, because detergents might be difficult to remove and the character of the sewage might be affected. The mechanically aerated plant at Batavia, Illinois, underwent violent foaming because of synthetic detergents which had been discharged into the sewers.[16] Sperry[17] believed that 10 ppm of active detergents had a deleterious effect on sewage treatment, and Cross et al[18] emphasized the point that household types of synthetics have a greater inhibiting action than the industrial types. Most household detergents contain about 30 percent active ingredients. Fuller[19] however, found no evidence that household detergents in concentrations of 100 ppm impaired the proper functioning of septic tanks and indicated that industrial detergents would possibly be more detrimental than household detergents.

British and South African opinions are also varied about the effects of detergents on sewage treatment. Sciver[20] used an anionic detergent, Teepol, which contained about 20 percent active matter on concentrations of 200 to 500 ppm, and found progressively adverse effects on sedimentation. Extensive research and large scale operations by Hurley[21] showed that Teepol at 150 ppm had no effect on any stage of the sewage purification process. The Teepol was almost completely removed during the treatment process.

Goldthorpe and Nixon[22] used Teepol and Lissapos (non-ionic) detergents and found a greater carryover of organic load to the biological plants when chemical precipitation was used. When 200 ppm of detergent was applied to a laboratory filter, a slow deterioration with ponding was noticed. In a symposium held in England, Lumb and Barnes[23] indicated that synthetic detergents did not react with emulsified impurities and precipitate them as was the case with soaps. Thus, organic loads on secondary treatment units were increased and the quantity of secondary sludge increased. Goldthorpe[24] et al indicated that the organic load on secondary units due to synthetic detergents might be increased 30 percent for domestic sewage and more than 100 percent for certain industrial wastes. South African investigators recorded a more optimistic point of view in regard to the possibility of treating wastes containing synthetic detergents.[25]

Degens and Van der Zee[26] reported that although digestion was not affected, biological oxidation of sewage was delayed by certain detergents. The mechanism by which this biological oxidation is hindered is explained by Knox, et al.[27] It was shown that several cationic detergents kill *Escherichia coli* and the detergents kill or inhibit in proportion to the detergent-bacterial ratio and not according to detergent concentration. Therefore, the specific inhibition of such detergent-sensitive enzymes accounted for the metabolic inhibition, death and increased permeability of bacteria.

Further work by Degens, et al[28] showed that fish were able to become acclimatized to fairly high concentrations of synthetic detergents. Other water fauna such as tadpoles, sticklebacks and daphnia were not so fortunate. Various anionic and nonionic detergents caused death to daphnia with concentrations of 5 ppm. In tests run with I (Na secondary alkylary sulfonate), II (Na primary alkylsulfate), III (alkylarlsulfonate), and IV (Polyglycol ether of alkylated phenol), it was shown that I and II decomposed biologically by the BOD test whereas III and IV did not. All samples were anionic except IV, which was nonionic. Samples I and II caused more rapid daphnia death than III and IV.[29]

More recent experiments using a

(*Continued on page* 133)

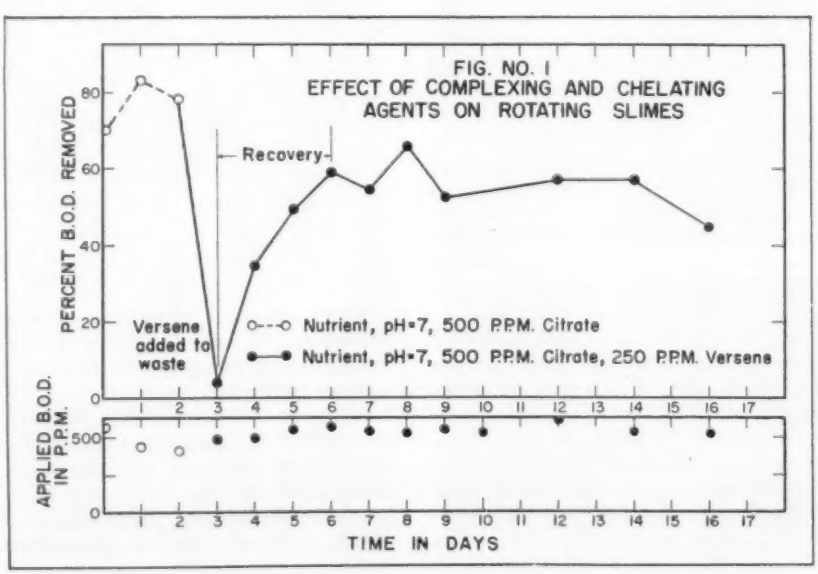


FIG. NO. I
EFFECT OF COMPLEXING AND CHELATING AGENTS ON ROTATING SLIMES
PERCENT B.O.D. REMOVED
Recovery
Versene added to waste
Nutrient, pH-7, 500 P.P.M. Citrate
Nutrient, pH-7, 500 P.P.M. Citrate, 250 P.P.M. Versene
APPLIED B.O.D. IN P.P.M.
TIME IN DAYS

● **ADDITION of Versene, a chelating agent, caused collapse of slime structure. Recovery followed but did not reach the former BOD removal level.**

Developing a SOIL-CEMENT PAVING PROGRAM

AN experimental three-block street paved with a base of soil-cement five years ago has developed into an ever expanding paving program in Peoria, Ill. This first job involved an area of 2,713 square yards, which was laid at a cost of $5,209.29, or $1.92 a square yard.

The soil-cement program was expanded the following year to 6,635 square yards; the year after, 18,000 sq. yds. were placed; in 1951 the program received a big boost to 44,743 square yards; in 1952, 69,036 square yards were laid; and in 1953, 54,412 square yards. Seneca Petroleum Co. of Peoria has been the contractor on all of the soil-cement paving jobs in Peoria with the exception of the original three blocks and one other small job. H. E. Scott is superintendent for Seneca and Arnold Pfeiler is city engineer.

The equipment Seneca uses in its soil-cement processing consists of three Seaman Pulvi-mixers; a Caterpillar No. 112 motor grader; a Cat HT4 shovel; a Caterpillar Thirty track-type Tractor 27 years old; a Cat Twenty-two track-type Tractor, 17 years old; a J. I. Case wheel tractor with a scratcher and plow; two sheepsfoot rollers; a Hercules cement spreader; water and asphalt sprinklers; four or five trucks; a Galion tandem roller; a rubber tired roller; and a Barber-Greene asphalt finishing machine.

A new soil-cement project on Harvard Ave. marks the 1954 continuation of the project started in 1948. This job began with a gravel base that was applied to 1,438 square yards during the previous winter. Following a rainy spring the soil-cement job got under way again in the middle of June. A motor grader began the process by scarifying the gravel base and any bituminous mixture that may have been put on previously. Three Seaman Pulvi-mixers then began pulverizing the material to a depth of 10 inches. Usually the depth of pulverization is eight inches; however, since state funds were used the state requirement of an 8-inch thickness of soil-cement made 10 inches of pulverization necessary to obtain an 8-inch soil-cement surface.

The project required a 13 percent cement content or 77 pounds of cement per square yard. The cement was mixed thoroughly into the soil and during this process a water sprinkler added the necessary water. The wheel tractor kept the curbings clean by making passes with a plow during the pulverizing and mixing operations. Following this mixing, the sheepsfoot roller began work. A small wheel tractor pulling a scratcher weeder or harrow followed the sheepsfoot roller to remove all compaction planes. During the compaction process water was added continually to keep the material from drying out.

The motor grader then shaped the soil-cement, giving it the proper crown (six inches in Peoria) and leaving one and a half inches around the guttering to allow for the bituminous surfacing to be added later. A rubber tired roller followed for final compaction of the top 1½ to 2 inches of material. The surface was again shaped true to line and graded by the motor grader and final compaction proceeded with the Galion roller. Within 24 hours a thin MC 3 asphalt covering was sprayed over the top with an asphalt distributor to act as a curing compound. No traffic of any kind was allowed on the street for from 7 to 10 days to let the cement set properly.

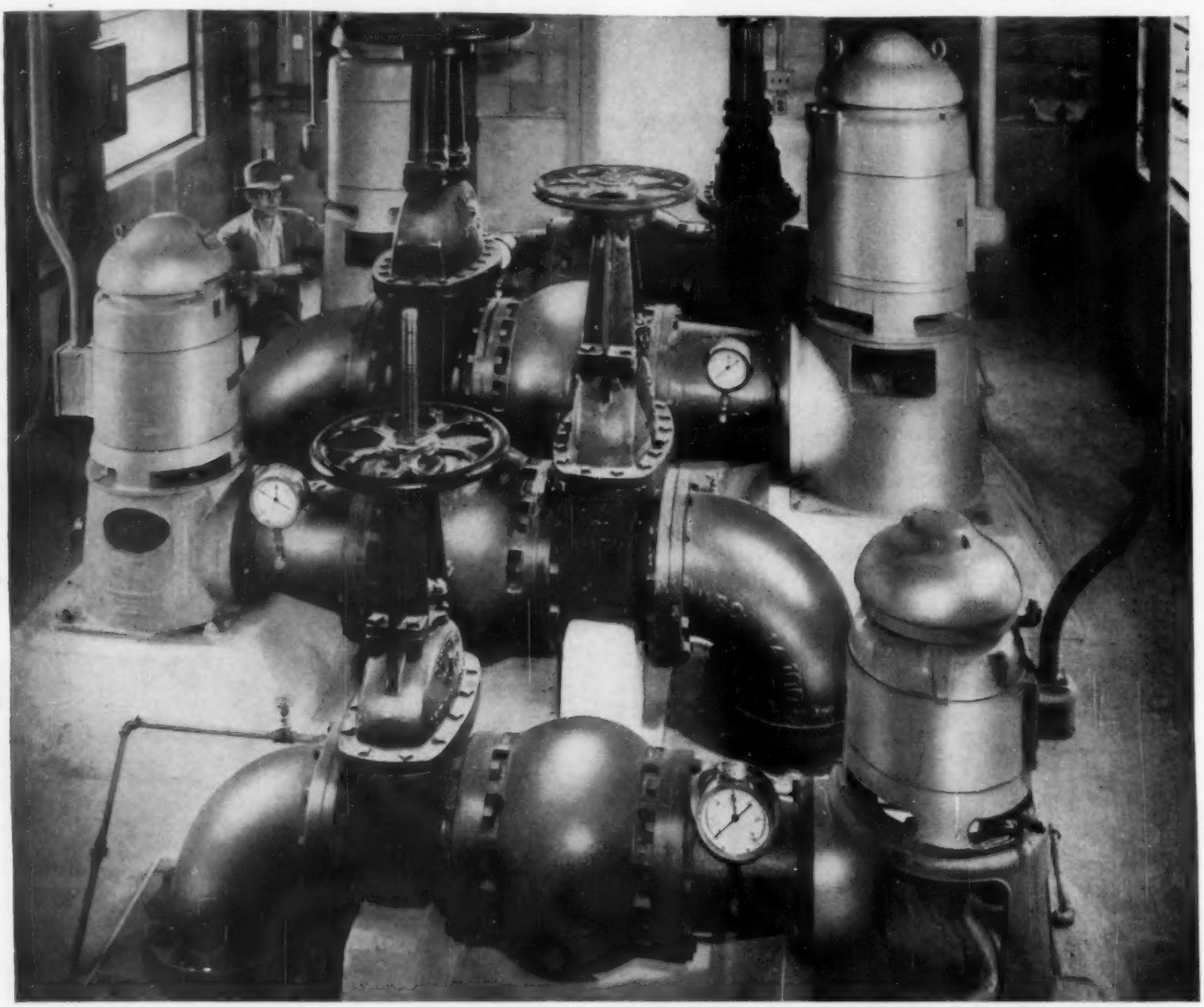
The final surfacing consisted of 1½ ins. of bituminous concrete, Illinois State sub class I-II. This was applied hot (290°) with a Barber Greene finishing machine and rolled out with a tandem roller.

After five years, the original street is in as good condition as it was when it was built in 1948. The city hasn't spent a nickel for repairs.

● **TANK TRUCK** equipped with a water sprinkler keeps the soil-cement moist while a motor grader shapes the mixture.

Photos courtesy Caterpillar Tractor Co.

● **MIXING** soil and cement with Seaman Pulvi-Mixer; truck spreads cement in next lane. Tractor shown is 17 years old.



FOUR WORTHINGTON VERTICAL TURBINE PUMPS deliver 14,500 gallons of water a minute to reservoir serving Van Wert, Ohio.

Versatile is the word for these pumps

Interesting thing about this new pumping installation for the city of Van Wert, O., is that four Worthington vertical turbine pumps, usually used for deep-well service, are delivering water from a shallow creek.

This type of pump was recommended after consultation with Van Wert engineers because it needs no priming devices, suction lines, or dry-pit construction. Moreover, its vertical design takes up less space than other types. The Worthingtons have proved a wise choice — they're highly efficient, their operating cost is remarkably low, and maintenance is practically nil.

We can help with *your* pumping problem, too. Just how, is made clear in our Bulletin W-450-B40. Write for it. Worthington Corporation, Vertical Turbine Pump Division, Section D.4.30, Succasunna, New Jersey, or Denver, Colorado. D.4.30

"See the Worthington Corporation Exhibit in New York City. A lively, informative display of product developments for industry, business and the home. Park Avenue and 41st Street."

WORTHINGTON

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

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CONSERVE GROUND WATER—IT IS A VALUABLE RESOURCE

APWA News

AMERICAN PUBLIC WORKS ASSOCIATION
1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

New Arizona Chapter is Fifth to be Formed in 1954

APWA's Newest Local Chapter Will Be Headed by E. E. Tufte

The tremendous growth in membership in the State of Arizona to more than fifty at the end of 1954, has inspired organization of a local chapter of the APWA. Much of the credit for the phenomenal growth in membership goes to the Association's Western Area Vice-President, K. K. King, who is Director of Public Works in Phoenix, and to Edward E. Tufte, Civil Engineer in the Public Works Department, who has so ably served as the Arizona State Chairman during the past year. Mr. Tufte was elected to serve as the first President of the new chapter; Phillip J. Martin, Jr., Manager of the Water Department of Tucson, was named Vice-President; and Thomas J. Nesbitt, City Engineer of Mesa, as Secretary-Treasurer. Guy A. Rhoads, Manager of Municipal Utilities of Safford, and R. G. Williams, City Engineer and Supt. of the Water Department of Winslow were elected to serve on the Executive Committee. The initial meeting of the new chapter was held in Wickenburg, in conjunction with the annual meeting of the Arizona Municipal League.

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Vice-Presidents
Edward P. Decher W. M. Swietlik
Kenneth K. King Albert G. Wyler

Past President
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Directors
Frederick W. Crane Roy W. McLeese
Raymond A. Williams W. D. Hurst

Treasurer
Robert L. Anderson

Executive Director
Donald F. Herrick

Recent Chapter Activities Reported

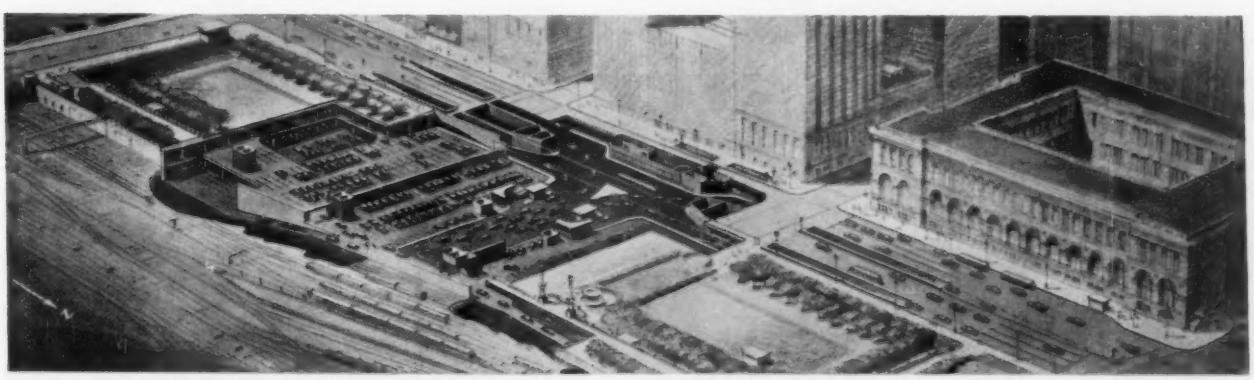
Nine of the Association's twenty-three local chapters held one or more meetings during the last few months. The most gratifying news to report is the formation of another local chapter—this one in Arizona—which is the fifth to be chartered by the Association during 1954. Program highlights of the other meetings and news of their members are reported below.

Pettingill Elected by Michigan Chapter

The Michigan Chapter elected a new slate of officers at its recent meeting in Detroit. E. L. Pettingill, City Engineer of Mt. Clemens was named President to succeed Louis Moehr, City Engineer of Wyandotte. Other members elected to office were Jan Schmedding, Supt. of Street Construction and Maintenance, Department of Public Works, Detroit, First Vice-President; Harold Hultquist, Field Engineer Concrete Pipe Association of Michigan, Second Vice-President; J. B. Jewell, Supt. of Public Works, Pontiac, Third Vice-President and Fred Cheek, Village Engineer, Trenton, Secretary-Treasurer. The Chapter's November meeting featured the presentation of a film entitled—"The Perfect Crime" by a representative of the Michigan Tractor and Machinery Company. This film, dealing with safety and the need for better highways, was produced by the Caterpillar Tractor Company in cooperation with the National Safety Council.

Chicago Members Inspect Parking Garages

Over one hundred members and guests of the Chicago Metropolitan Chapter attended a program devoted to a discussion of Chicago's new parking facilities. Robert J. Kelley, Supt. of Parking and Walter Cleave, Vice President of Blyth Co., Inc., told about the ten multi-level parking facilities which are to be completed by the end of 1955. Victor Hofer of the consulting engineering firm of Ralph Burke, Inc., discussed various aspects of the Park District's underground garage—the largest in the world, with a capacity for 2,359 cars. After the luncheon meeting, the members and their guests inspected the underground garage which was opened September 1, and the LaSalle Street garage which is the first part of the city's $50 million parking



New parking facilities for Chicago, discussed by local chapter, included the underground garage shown in this cut-away view

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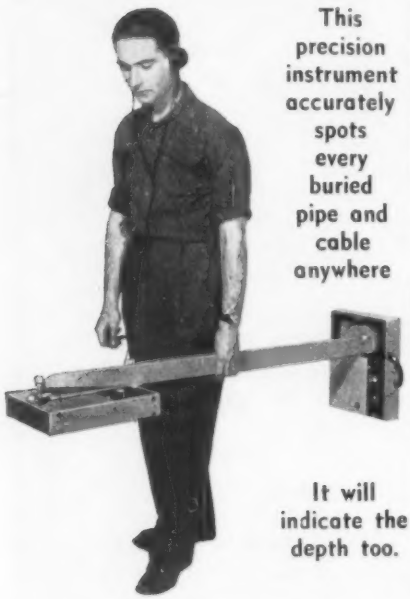

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program to be completed. This particular facility, which was opened October 8, is a twelve-level, hoist type, parking garage with a capacity for 495 cars. The ten multi-level structures will have a combined capacity for 6,899 cars. Numerous parking lots, with additional capacity for 3,851 cars, are also being constructed as part of Chicago's vast parking program.

Construction Plans Discussed at San Diego

Over fifty members and guests of the San Diego-Imperial County Chapter met in San Diego, to outline their proposed construction programs for 1955. Projects outlined by officials from that area totaled more than $90 million. This covers proposed projects of the State Division of Highways; the U. S. Navy; San Diego County; the cities of San Diego, Oceanside, Carlsbad, Coronado, La Mesa, Chula Vista, and National City; the San Diego Gas and Electric Company; Pacific Telephone & Telegraph Company; California Water and Telephone Company; and several other organizations.

Legal Aspects of Mississippi Bridge

Charles Cassagne, Jr., Administrative Engineer for the Railroad Terminal Board, and President of the New Orleans Chapter, presided at its meeting which featured an interesting talk by J. Raburn Monroe, Attorney for the Mississippi River Bridge Authority, on the legal and financial aspects of a new multi-million dollar bridge which will span the Mississippi.

Southern California Re-Elects Henderson

The annual election of officers was held at the November meeting of the Southern California Chapter at Los Angeles. William M. Henderson, retired official of the Southern California Gas Company was re-elected President, while J. F. Martinek, City Engineer of Whittier and Frank E. Randall of the Pacific Telephone & Telegraph Company were re-elected to their respective offices of First Vice-President and Secretary-Treasurer. B. R. Paris, Asst. General Supt., Bureau of Street Maintenance of the City of Los Angeles was elected Second Vice-President to succeed J. Lester Boyle, Consulting Engineer of Santa Ana.

The afternoon program consisted of the presentation of a safety film and a demonstration of safety techniques used in the Bell System by Jack J. Webb, Division Plant Safety Supervisor and Ward E. Berry, Splicing Foreman of the Pacific Telephone and Telegraph Company. Reports of six chapter sub-committees that are working on standard procedures for occupancy and work projects on roads and streets were also presented and discussed at the afternoon session. William R. Smith, Consultant in Public Administration and Industrial Engineering for the Booz, Allen & Hamilton Company gave a very informative talk on economics in public works at the dinner meeting.

Philadelphia Reviews '54 Congress

Highlights of the Atlantic City Public Works Congress were discussed at a meeting of the Philadelphia Chapter. Thomas Baldwin, Chief, Automotive and Property Maintenance Section, and President of the Chapter described the various types of equipment that were displayed at the Equipment Show. Henry Harral, Street Commisioner discussed highlights of the Congress. John Bailey, Commissioner, Division of Sanitation, spoke regarding incineration; Alexander Maltman, Asst. Chief, Department of Water, reported on the water pollution discussions; and David Smallwood, Chief Engineer of their Highways Section, reviewed the sessions on street maintenance and construction.

Offner Speaks at Northern California

Milton Offner, Immediate Past President of the APWA, discussed the objectives and responsibilities of the Association at the annual meeting of the Northern California Chapter, held in Berkeley. Another highlight of the program was a panel discussion on planning a new community. The moderator of this discussion was Bob Glenn, As-

(*Continued on page* 104)

Swietlik Appointed Milwaukee Congress Chairman

Walter M. Swietlik has been formally appointed by APWA President Warren A. Coolidge as the Local Chairman for the 1955 Public Works Congress and Equipment Show to be held in Milwaukee, October 2 through 5. Mr. Swietlik, recently elected APWA Central Area Vice-President, has been Milwaukee's Commissioner of Public Works for the past fourteen years. Support will be given the Commissioner and his Committee not only by his home state chapter of APWA but also by the Chicago Metropolitan Chapter.

While the Hotel Schroeder has been named headquarters hotel, the Milwaukee convention bureau has assured the Association of the cooperation of five or six other leading hotels in the assignment of sufficient rooms for the duration of the Congress. A list of these cooperating hotels together with a schedule of rates and their proximity to the Auditorium will be sent to all members within the next few months.

The Equipment Show and sessions will be held in the Municipal Auditorium. The first meeting of Commissioner Swietlik's Committee was held last month. The 1955 Congress should be the largest the Association has ever held. It is not too soon to make your plans to attend this conference. The date is October 2nd through 5th, 1955.

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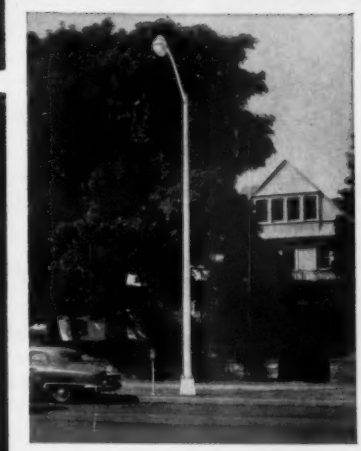

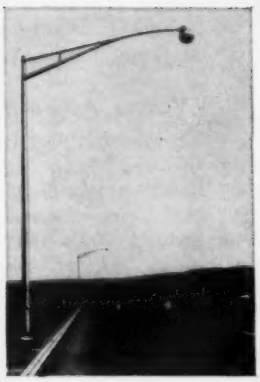

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Washington news

Presented in cooperation with the American Public Works Association and through the courtesy of the Washington Office of the American Municipal Association.

Stand-By Public Works

President Eisenhower's budget director, Rowland Hughes, has issued strict orders to all government agencies to consider the matter of stand-by public works in the preparation of their budgets for the ensuing fiscal year. Recent instructions contained the following paragraphs:

"(b) Emphasis will also be given to carrying forward general investigations and advance planning of essential public works, including those required for future economic growth, to such a stage that the Federal Government would be ready effectively to accelerate its public works program at a desirable time.

"9. Advance planning of national security construction: Adequate provision should be made for advance planning of military public works and other national security construction.

"10. Maintenance and repair of Government facilities will be held to the minimum level required for continued safe operation and prevention of excessive and costly deterioration".

Thus, public works advance planning receives a "shot in the arm", even with a budget which is being prepared under strict economy measures and with a philosophy of a balanced budget.

Sewage Treatment Plants

The U. S. Public Health Service Department of Health, Education and Welfare, reports that municipalities awarded in 1953, contracts amounting to $191 million for 615 new or improved sewage treatment plants; 320 new plants were built at a cost of $96 million; and $95 million was spent for enlargements, additions or replacements to 286 plants.

This just about kept pace with the yearly requirements now estimated at $200 million for construction of municipal sewage treatment plants to keep pace with currently developing needs, due to increases in population and plant obsolescence. A backlog of between $2½ and $3 billion exists, however, which remains practically untouched since its accumulation during and immediately following World War II.

Voters Approve Public Works

The Washington Bureau of the Associated Press, and the Washington headquarters of the Associated General Contractors say that voters approved on November 2 and gave the green light to about $1.2 billion in new bond issues for new public works. More than 80 percent of all public works issues on the ballot carried successfully. Voters ok'd new issues for highways, schools, hospitals, water works, sewerage systems and just about every other kind of public works. The total was half again as great as the $800 million approved in the 1953 off-year elections, when fewer bond referenda were proposed. The 1954 total is close to the record $1.3 billion approved in 1952. In most of the cases where bond issues were rejected, the adverse vote seemed to reflect special local situations rather than a general sentiment toward reduced spending on public projects.

$50 Billion For Highways

Biggest highway news in U. S. history is in the making in Washington. The President's Advisory Committee on a National Program met on November 19th to consider its preliminary report to the President. The Committee, under the chairmanship of General Lucius D. Clay, was assigned the task of preparing detailed plans to fulfill President Eisenhower's "grand plan" for improving the nation's highways first outlined to the Governor's Conference from the President's notes by Vice-President Nixon.

Some of the committee's findings,

Salute to a Sale

It's odd why almost everyone takes for granted the great diversity of talents required to bring forth a manufactured product. Yet, little or no thought, and even less awareness, is given one extremely important factor from which comes our entire business existence—the Sale.

A sale, regardless of what is sold, represents the ultimate realization of success and satisfaction to the great band of men spirited enough—worthy enough—to bear the title "Salesmen". Each hard-won prospect, every successful closing, reaffirms to these men their faith and sense of reward—the stuff on which they truly grow rich.

Let's leave to others the everyday statements used to describe a sale. Here, let's speak of the human, seldom-mentioned forces which yield, one to the other, to finally produce the true foundation of our competitive business existence—the Sale.

A sale is manufactured with the power of faith—faith a man has in the people who guide him intelligently in his daily efforts—faith in the sureness that his product or service is right—right for the purchaser and even more important, right for him to honestly give of his time and fierce conviction of quality and integrity.

A sale is clothed in work. A sale is not born, but is hewn from the stouter things of life. A sale is work that sometimes takes the lonely form of distant hotel lobbies and restaurants—that makes bearable the long, weary hours at a convention booth or behind the wheel of a rented car headed for the next call. A sale is a taskmaster that demands of its victors—patience, hope, planning and even a little prayer now and then.

Most sales really begin long before any dotted line is signed. They are born within men, through the canny ability to recognize a basic need or offer a better way of doing things. A sale is proof of, and may only come about, through careful concentration and preparation, intelligence and resourcefulness.

A sale requires unending support that necessarily must come in varying forms. From management, tools we'll call constructive encouragement, leadership and wisdom. From home, in the form of understanding, love and security. Lastly, from within, through a well placed will to do the job as it is set squarely and objectively in focus.

A sale walks proudly in the garb of reward. It may mean a long awaited new dress for a man's wife or the chance to get that rear-left fender bumped out. It might mean that a plant somewhere can now make their shoes or toasters or tennis rackets on a new and improved piece of equipment and thus help to create a quality product at a lower cost to all.

A sale is the vitality of today and the hope of tomorrow. If ever someone writes of the last sale made—that will surely proclaim to all in a bold and devastating hand that we no longer care to grow—that we no longer care to exist.

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based on reports from the various state road are as follows: (1) Mileage of all public streets and highways 3,348,000. (2) Annual vehicle miles of travel—1941: 333,396,000,000; 1953: 557,000,000,000; 1965: 814,000,000,000. (3) Motor vehicle registrations—1941: 34,894,134, 1954: 58,129,000. 1965: 81,000,000. (4) Preliminary estimate of total construction needs for all streets and highways in the U. S. through 1964 to meet estimated traffic needs of 1974 is $101,365,000,000. (5) Expected to be available through 1964—about $48 billion. (6) Deficit for which recommendations on financing will be presented to the President and thence to Congress is about $54 billion.

The Committee is expected to recommend the creation of a National Highway Authority, set up as an independent agency of the federal government and charged with the administration of the new program in cooperation with the Bureau of Public Roads. Already, Bureau of Public Roads, Commissioner Dupont, has announced his resignation as of early January in order to take over as special assistant to the Secretary of Commerce in handling this program.

Informed Washington sources predict the retention of the present 2¢ Federal gasoline tax. One cent will go to finance the new program with the remaining cent distributed among the present federal aid road programs (primary, rural or secondary and urban primary) on a 45%, 30%, 25% formula. The interstate system will probably be wholly financed as a federal obligation, using the 1¢ of the gasoline tax for capitalization of about $25 billion worth of federal highway bonds.

The newly established commission, if approved by the Congress, will have flexibility enough to give some sort of "credit" device to those states which have financed an accelerated highway improvement program in recent years. Major concentration, besides being on the interstate highway system, will also be on the major city streets and expressways.

• • •

Chapter Activities

(*Continued from page* 100)

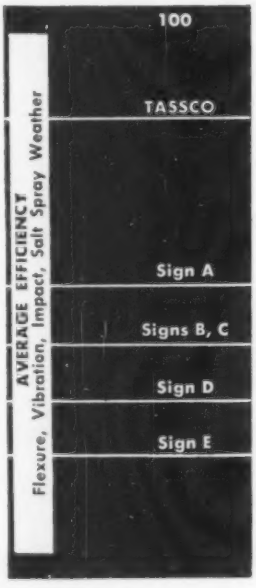
sociate Engineer of the Institute of Transportation and Traffic Engineering of the University of California. Frank B. Sarles, City Engineer of Santa Rosa was moderator of a very popular session which rounded out the technical program and featured a panel of specialists answering questions on a wide variety of subjects.

Francis H. Moffitt, Assistant Professor of Civil Engineering, at the University of California gave an excellent talk on the Lambert Projection (California Coordinate System) method of surveying at the Chapter's October meeting in Oakland. This method, he said, was used by several governmental agencies in that region including Alameda and Contra Costa Counties and the State Division of Highways. His talk was illustrated by a basketball representing the earth and a paper cone which showed how a portion of a sphere can be reduced to a plane surface. The advantages of using coordinates in plane surveying were also discussed.

Manitoba Group Sees Kitimat Film

The second meeting of the newly organized Manitoba Chapter was held recently in Winnipeg. William Aldridge, retired City Engineer of Winnipeg, and the only senior member of the APWA in Canada was elected Honorary President of the Chapter. Committees were also appointed to carry out assignments which are designed to develop further this new chapter. An interesting film on the Kitimat Development in British Columbia was also presented by Elmer Quinn, who represents the International Harvester and Kane Equipment Companies in Winnipeg.

the TASSCO story



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Traffic and Safety officials are invited to write for the new Tassco catalog, and to use the Tassco advisory services without obligation.

*Excerpt from letter of report on tests conducted under the auspices of one of the nation's largest municipalities, under impartial laboratory conditions using standard testing equipment. Report is on file and may be seen on request.

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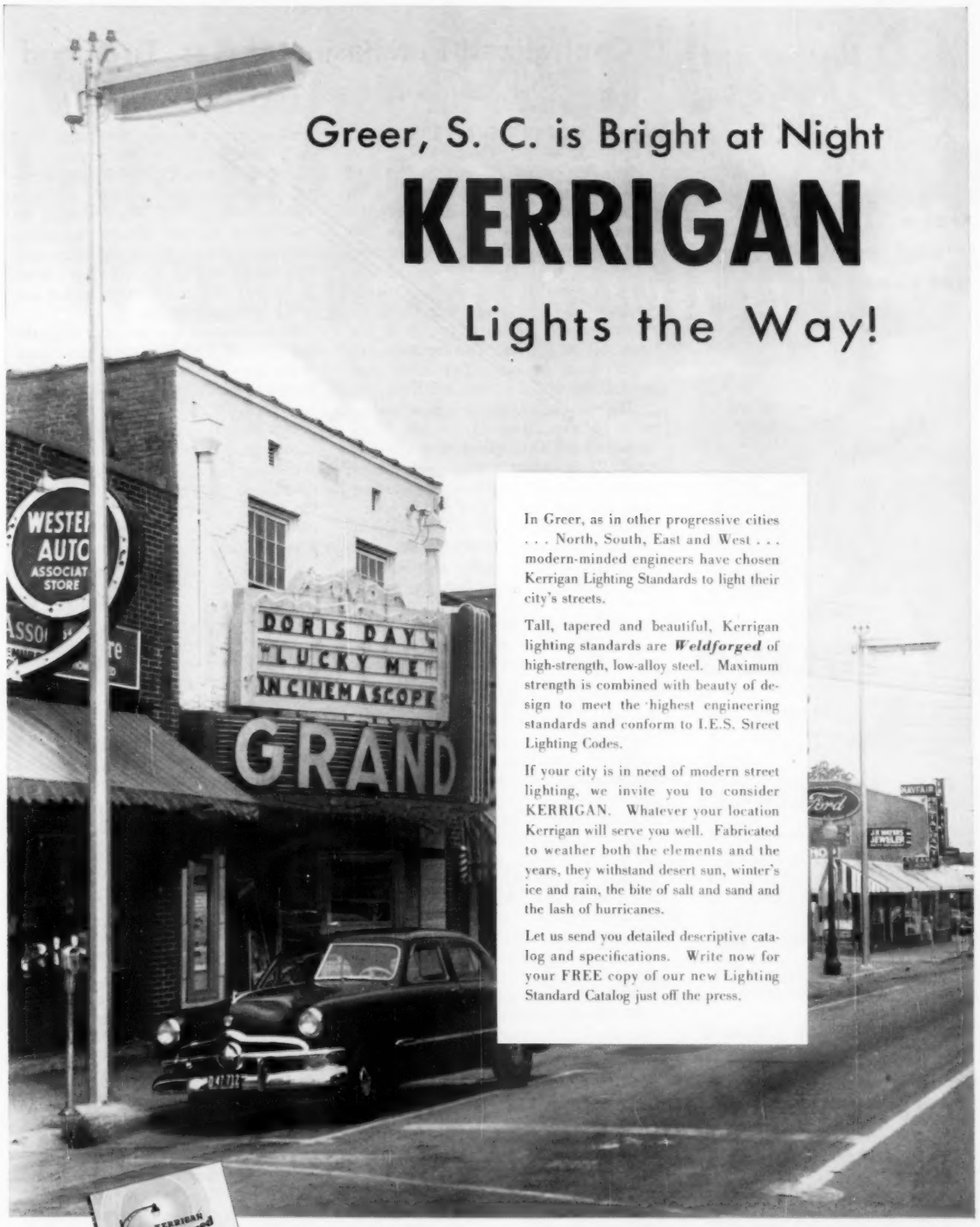

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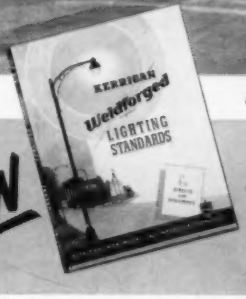

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Centralized Purchasing of Gas, Tires and Oil Saves Money for Iowa City

ROBERT E. MYERS

CENTRALIZED purchasing of gas, oil and tires has been in effect in Iowa City, Ia., since August, 1951. The prime purpose for the establishment of this system was economy; a secondary purpose was to standardize purchasing procedure and to lessen the work of procurement and distribution of the gas, oil and tires. The system has now been in operation over two years.

Before centralization, purchasing was by departmental buying. Each department head purchased the gas and oil his department needed. Since there were no facilities for storing gas and oil, these had to be purchased directly from a gas station at the time of delivery to the vehicle. In most cases the regular retail price was paid, but the price varied from department to department; departments using large quantities were able to secure a somewhat lower price. Business was usually passed around among the various stations. During March, 1951, for instance, the Street Department purchased gas and oil from ten different stations and the Police Department from three different stations.

Each department kept its own records of its gas purchases. The driver of a city vehicle could go to the station designated by the department head and receive the gas and oil the vehicle needed. He would sign a receipt and receive a duplicate. This duplicate he would turn over to the department head. Once a week the department head would turn the duplicate receipts in to the city clerk. The various service stations from which purchases had been made would send bills to the city at the end of the month. The city clerk would then have to check each of these duplicate receipts turned in by the department heads for accuracy and validity against the bills submitted by the gas companies. The Street Department might make as many as fifty or sixty purchases a week and the Police Department twenty or twenty-five. There were often as many as fifteen different stations submitting bills. Usually the federal tax, from which the city is exempt, would be included in the bill and the clerk would have to compute and subtract the tax from the final bill. Warrants, for the payment of these bills, would be made to service stations and often there was one from each of the departments to the same station. These warrants ranged in size in March, for example, from $1.27 to $98, there being a total of twenty-three warrants issued for gas and oil purchases.

If tires were needed, the department head would inquire the price from the various tire dealers, decide from which dealer he wished to make the purchase, and then request action by the city council which would pass a resolution authorizing the department head to make the purchase at a price not to exceed the amount named. Each tire or set of tires required a special resolution by the council.

After Centralization

When the plan for complete centralization was adopted, an underground storage tank and a metered gas pump were purchased and installed at the city yards. Space was provided for storing oil. The total cost of buying and installing this storage tank and pump and of providing storage for oil was $624.77. Competitive bids were then taken on the amount of gas and oil that it was estimated would be used in the next six months. The first bids were taken on 10,000 gallons of gas and 250 gallons of oil, the dealer to deliver the gas and oil to the city yards as needed. A daily gas and oil report is filled in as city vehicles receive gas and oil at the yard. The weighmaster, a regular employee at the city yards, handles this report. When a vehicle needs gas or oil, the driver comes to the city yards, places a ticket in the metered pump, fills his vehicle with gas, notes any oil used and turns the ticket over to the weighmaster. The weighmaster enters the amount used on the daily report, and charges the gas and oil to the particular vehicles and department. This daily report, along with the gas tickets is forwarded to the city manager's office. The daily reports are totaled monthly and each department charged for the gas and oil it has used on the basis of the price under the current bid. At the direction of the city manager purchase orders are drawn on each department for its share of the gas and oil. Increases, the receipt

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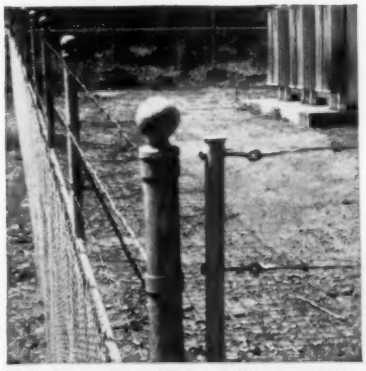

Note thorough job "Telvar" did around this fence. "Telvar" won't corrode fence or equipment; it's non-flammable, non-volatile.

Heavy weed growth around pole was controlled with one application of "Telvar." It's easily applied and extremely low in toxicity to humans and animals.

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FREE ILLUSTRATED BOOKLETS describe how to control weeds and brush with Du Pont chemicals. For your copies, write to Du Pont, Grasselli Chemicals Dept., Rm. D 4038, Wilmington, Del. In Canada—Du Pont Company of Canada Limited, Montreal, Box 660, Canada.

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On all chemicals always follow directions for application. Where warning or caution statements on use of product are given, read them carefully.

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"Ammate," applied five years ago, is still keeping brush down along this right-of-way.

Maintenance crews prefer "Ammate" because they can use it without hazard to themselves, livestock, wildlife or adjoining crops.

Same right-of-way as above, three years after treatment. Brush still under control; low-growing cover returned to resist erosion.

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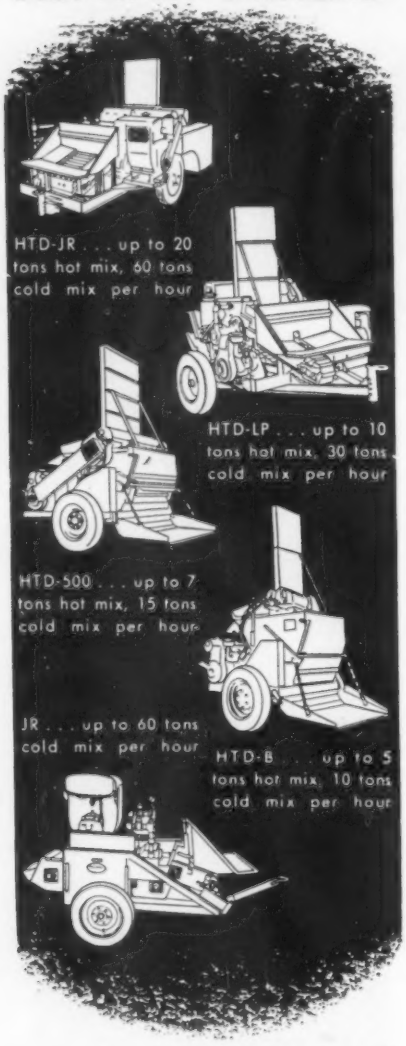
HTD-JR . . . up to 20 tons hot mix, 60 tons cold mix per hour
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HTD-500 . . . up to 7 tons hot mix, 15 tons cold mix per hour
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of more gas and oil than is consumed, and decreases, the consumption of more gas and oil than is received, in inventory are credited or charged to the Street Department. It takes only one warrant from each department using gas and oil to pay the city's monthly gas and oil bill.

With the new centralized control over tire purchases, all requests for tires come through the city manager's office. The department head requests the size, ply and grade of tires he wants. The city manager then requests bids from all dealers handling the tire specified. The city manager is authorized to make the purchase. The council is thus relieved of passing a resolution for every tire purchased.

Comparative Costs

Gasoline—In the six-month period preceding the establishment of centralized purchasing, the city vehicles used a total of 11,408 gallons of gas, costing $2,867.46. Of this amount the Street Department was the chief consumer, using 7,349 gallons costing $1,837.99. The Police Department followed with 3,226 gallons at a cost of $841.70. The Fire Department paid $137.82 for its 640 gallons. The remaining 193 gallons, costing $49.95 were used by other departments. The average over-all cost per gallon of gas was 25.13¢.

During the six months ending October 31, 1953, the city consumed 16,983 gallons of gas, costing $3,398.41. The Street Department led in consumption with 6,840 gallons, followed by the Police Department with 5,320 gallons. The newly established Sanitation Department used 2,730 gallons, the Fire Department 742 gallons and other city departments 1,342 gallons. All the gas was purchased from one dealer, delivered to the city yards and distributed to the various vehicles from the city gas pump. The average cost was 20.01¢ per gallon. This represents a saving of 20.3% on each gallon of gasoline purchased.

Oil—From January 1 to June 30, 1951, the city used 625 quarts of motor oil costing $186.63. All of this oil was purchased as it was actually used, a quart or more at a time, except for the Fire Department which purchased its oil in case lots and stored it at the fire station until needed. The price per quart ranged from a high of 38¢ when purchased by the single quart to a low of 25½¢ when purchased in case lots. The average price per quart was 29.8¢.

From May 1 to October 31, 1953,

● **COMPLETION of New York City's South Street Viaduct marks the first major application of mercury vapor lighting to the city's expressway system. This Westinghouse installation produces an average of 2.26 foot-candles at the road surface. The poles are spaced at 130-ft. intervals and the lamps are mounted at 28 ft. Due to higher efficiencies and longer lamp life, operating and maintenance costs will be lower. Operation is controlled by an astronomical time switch that turns on the lights when it gets dark and turns them off when they are not needed.**

the city used 995 quarts of oil. This was delivered to the city yards by the dealer in cases of quart cans and dispensed to the vehicles there. The total cost was $189.86. The average cost per quart was 19.07¢. A saving of 36% on each quart of oil was realized.

Tires—Among the tires purchased in 1951 were a complete set for one police squad car and two maintainer-grader tires. The five tires purchased for the squad car were 710x15 premium grade tires. The cost was $175.28 for the five tires and tubes. A 9x24 grader tire was purchased at $117.56, and a single maintainer tire, size 13x24, at a cost of $152.04.

In June, 1953, bids were taken on tires for a police car. The dealer from whom those tires were purchased in 1951 submitted a bid of $27.92 for exactly the same tires and tubes, or $138.68 for the set of five. A comparable tire and tube from a different dealer was purchased, however, at $27.72 per tire and tube. The price paid for these tires in 1953 represents a savings of 31% over the price paid in 1951. Although no maintainer-grader tires were purchased during 1953, bids are on file for these same size tires. The 9x24 grader tire has been quoted at 38% off list price of $133.45. The 13x24 maintainer tire is priced to the city at $146.19. The more recent prices are from 10% to 30% less than were those charged before centralized control was established.

Conclusions

The lower prices which the city now pays for its gas, oil and tires cannot be attributed to a decline in costs. During the period January 1 to June 30, 1951, the open market pipe-line price of gasoline at Iowa City averaged about 12¢ a gallon. This market price of gasoline on which all other prices (retail, dealer, tank wagon, etc.) are based, varies from week to week and month to month. In general, however, during the first six months of 1951 the price stayed right around the 12¢ mark. This is the base price, exclusive of all taxes and transportation charges. In 1953, from April to October, this pipe-line price was slightly higher. The current figure is 12.29¢ per gallon. Thus, even though there has been an increase in the base price, the city has been able to purchase gas at a lower price in 1953 than it could in 1951.

The picture is much the same for oil. In 1951 the dealer price for oil, that price at which the dealer buys his oil, was 21¢ a quart for premium grade oil in quart cans. Once again the use of centralized purchasing has been able to overcome an increase in price and still produce a savings.

For tires no such broad generalization can be made. The dealer cost of some tires has risen considerably. The cost to the dealer of a 13x24 maintainer tire in 1951 was $136.20. It is now $194.55. For a 825x20 truck tire, the dealer cost in 1951 was $72.95 and is now $89.92. For some of the smaller passenger car tires, however, no increase or only a slight increase has occurred. A 670x15 passenger car tire has risen from $16.70 to $17.52. The trend has been generally upward, although in some cases only slightly, but there definitely have been no reductions.

The savings that have been realized in dollars and cents have not been offset by any increase in wages or the addition of any personnel to operate the plan. Indeed savings of time and effort, on which it is difficult to place a dollar and cent sign, have been realized. The City Clerk has been relieved of the task of checking many receipts and differ-

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ent bills sent to the city. This job, which formerly occupied one full day each week of the clerk's time, is now performed in one day each month, by one of the secretaries or clerk typists. The number of bills received by the city is one instead of fifteen or twenty. The number of warrants required to pay the city's monthly gas bill has been reduced from twenty to ten. The department heads have been relieved of keeping their own records and of selecting the place where gas and oil will be purchased. The standardization of gas and oil used in the vehicles has probably been good for the vehicles. The council has been relieved of the necessity of passing a special resolution for each tire purchase.

These savings, then, of 20%, 31%, and 36% are significant, and can be attributed to centralized purchasing. Converted into dollars and cents, they mean a savings of 5¢ on each gallon of gasoline and 10¢ on each quart of oil. The city uses approximately 40,000 gallons of gasoline a year. This means $2,000 a year have been saved by competitive bidding and quantity buying. This is enough to pay for the installation of the city gas pump and still buy 6,000 gallons of gasoline.

The savings in oil are proportionately greater. Before centralization, 625 quarts of oil cost the city $186.63. With centralization, 50% more oil was purchased at a cost of $189.86 or only $3.23 additional. In effect, the city was buying three quarts at the price it formerly paid for two.

The most current bids received by the city and the ones under which they now operate call for the delivery of gas at a cost of 20.3¢ per gallon. Oil is being purchased at the price of 71¢ a gallon or 17.7¢ per quart. The last request for bids saw eleven dealers bid on the gas and oil. Using this as a guide, it seems reasonable to assume the city will continue to realize significant savings by centralized purchasing of gas, oil and tires.

• • •

Navy Adopts Procedure for Patching Plastic Pipe

The Navy recently adopted a new plastic patch that has partially solved the problem of emergency repair of ruptured or damaged piping aboard ship. The plastic patch, which has the simplicity of a first aid bandage for a wounded man, is easily applied and can, for instance, put a ruptured fire main system, magazine sprinkling, or salt water cooling system back into operation in approximately 30 minutes. Tests so far indicate that metallic plastic pipe patches should be used only on salt or fresh water piping whose pressure does not exceed 300 pounds, or whose temperature is not above 200° F. However, other tests are now being conducted to find methods of applying this plastic patch to lines carrying steam, gasoline, or other material. The patch can be used on most types of ruptures, including a section of pipe that has been completely separated; a ruptured elbow, that is located on any curved section of pipe; a compound rupture with protruding edges; or ruptures in fittings. To apply a patch to a severed or ruptured metallic pipe requires approximately 15 to 20 minutes, and pressure can be restored to the system within 30 minutes after application. Little skill is needed to apply the patch, as the materials, before hardening, are pliable and easily applied. The life of the patch is unknown as yet.

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CAST IRON WATER MAIN

TIED IN WITH NEW

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PUBLIC WORKS DIGESTS

THE SEWERAGE AND REFUSE DIGEST

Automatic Sampler For Deep Sewers

A continuous automatic sampler for taking samples from a sewer 20 ft. below grade was designed and has been used for three years by the Hooker Electrochemical Co. Trial designs, one using a positive displacement pump above ground and another using timers and valves to collect small samples at frequent intervals, were unsatisfactory. The design adopted uses a deep-well pump to pump a continuous stream of sewage to the surface at about 5 gpm; here the sewage passes through a horizontal pipe and then vertically back to the sewer. In the horizontal pipe is a sampling tap through which a small stream runs continuously. A 1/3 rpm motor mounted nearby carries, on a horizontal arm from its vertical shaft, a 3 cc glass sample cup which, during its revolution, passes under the sampling tap and receives part of the falling stream of sewage. This sample cup is pivoted from the top and, after being filled at the sampling tap, is tipped and discharges its contents into a sample collection bottle. This sampler allows satisfactory sampling of streams containing suspended solids; delivers the sample rapidly, and requires little maintenance.

"Design of a Continuous Automatic Sampler for Deep Sewers". By Jerome Wilkenfeld, Hooker Electrochemical Co. *Sewage and Industrial Wastes*, November.

"Walkie-Talkies" In Sewer Maintenance

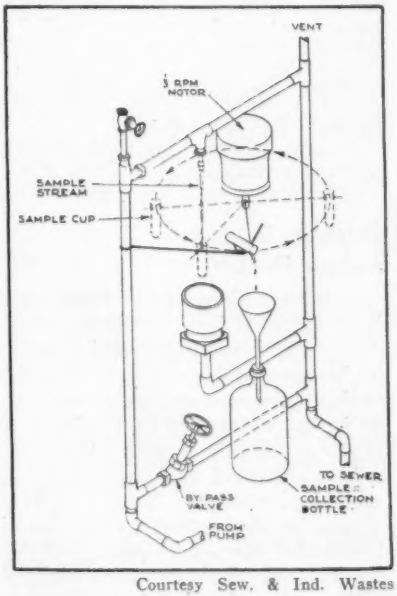
The Sewer Maintenance Div. of Los Angeles, Calif. maintains approximately 4,000 miles of main line sewers and 800 miles of storm drains. Many of the older sewers and drains were laid before the streets had been laid out, and are now under buildings since constructed. In many cases it is impossible, because of these buildings, to see from one manhole to the next, which makes it difficult to inspect or clean the intervening sewer. In such cases, the use of walkie-talkies is almost necessary. They are also used instead of flags or other signals by operators stationed long distances apart, as at siphons under rivers, or during night work. They are not, however, too successful for use between men inside a sewer and others on the street above.

"How Walkie-Talkies Help in Sewer and Storm Drain Maintenance". By Alvin A. Appel, Supt. of Sewer Maint. *PUBLIC WORKS*, December.

Compact Design Of Treatment Plants

The authors describe a type of layout of treatment plant units in concentric circles, the operator being at the center of all units, with the more commonly used units readily available and the less commonly used units further away from the center of operations. Advantages claimed include more pleasing appearance, simplicity of odor control, less cost of future expansion and convenience for the operator.

"Theory of Compact Waste Treatment Plant Design". By R. L. Smith and C. D. Pihlstrom. *PUBLIC WORKS*, December.



Courtesy Sew. & Ind. Wastes

● **AUTOMATIC sampler for sewers.**

Causes of Cleveland's Sewer Explosion

In September, 1953, an explosion in the sewers of Cleveland, Ohio caused damages estimated at $2,500,000, the death of one person and serious injury to several score others. A committee of engineers appointed to investigate the cause and to recommend precautions for preventing a recurrence made a thorough study of all conditions that seemed to be possible causes of the explosion. In this article the chairman of the committee described at length the study made of these possibilities—natural gas and oil in underground strata, abandoned gas wells, industrial wastes, and leakage from gas mains. They concluded that the most probable cause was either industrial wastes or gasoline leaking into the sewer, or both combined. Also, as a contributing cause, the absence of ventilation openings in manhole covers. They recommended that an organization be set up for routine testing of the atmosphere of manholes and sewers and utility vaults, and of possible underground leakage at gasoline service stations and industrial installations.

"Industrial Wastes or Gasoline Caused $2,500,000 Explosion". By Prof. George E. Barnes, Case Inst. of Technology. *Wastes Engineering*, November.

Orlando's Prize Winning Treatment Plant

Orlando, Florida has been operating since June, 1950, a sewage

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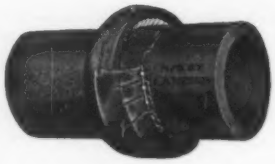

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treatment plant which was awarded, in 1953, the Florida State Board of Health Merit Certificate as the best operated trickling filter plant; and in 1954, the Annual Sewage Plant Merit Certificate for the best operated sewage treatment plant of any class. The plant is of the two-stage series-parallel Biofiltration type, with split recirculation. The design capacity is 8 mgd average, 16 mgd maximum. A mixture of raw sewage, recirculated primary filter effluent, humus sludge from the secondary clarifiers and supernatant liquor return is clarified in two Dorr primary clarifiers providing a detention time of 2.5 hours. The removal of BOD in the primary clarifiers averaged 76 percent and of suspended solids 70.1 percent. The high settling rate of solids is produced by the effect of the humus recirculated from the primary filters and the secondary clarifiers; and the high BOD reduction can be attributed in part to the increased solids removal. Up to midsummer of 1954, 8,150 million gallons had been tested, at a cost for maintenance and operating materials of $1,-054.95.

"Design and Performance of an Award Winning Sewage Treatment Plant". By J. V. Swift, The Dorr Co. *PUBLIC WORKS*, December.

Operating Details Of Sanitary Fill

This article gives tabulated details of the operating of 138 active sanitary fills throughout the country. These details include the number of people served, volume, layer depth, type of soil, settlement, equipment used, supervisor and size of crews. The populations served range from 2,000 to 800,000; the smallest being Othello, Wash., the largest, San Francisco.

"Sanitary Fill Roundup". *American City*, November.

Crickets in Refuse Dumps

Crickets, along with rats, have been found to breed in some refuse dumps in this country and migrate to houses in the vicinity; but the problem they present does not seem to be so serious as in England. A case recently dealt with at Twickenham, England is described in an English periodical. House crickets (*gryllulus domesticus*) were found to infest a dump and enter near-by houses. Householders were advised to lay protective barriers of Gammexane powder near doors and french windows; and experiments were begun on methods of eliminating the crickets from the dumps by use of dieldrin, an insecticide which has been used with success against the desert locust. After cutting off the weeds on the dump, a solution of 1 oz. to 20 gal. of water was sprayed over it. In about two months the crickets had almost disappeared. The cost of the dieldrin used on about 3,000 sq. yd. was about 6 shillings. More convenient for use would be a miscible oil form of dieldrin, estimated to cost about 7S6d per acre.

"Twickenham Tackles Refuse Tip Crickets in a New Way". By H. G. Easter, Chief, San. Inspector. *Municipal Engineering*, October 15.

Trouble-Free Sewage Pump Controls

Los Angeles, Calif. operates 28 sewage pumping stations and is preparing to install two more. In most of these, the pumps are controlled by floats operating in stilling wells. These have given so much trouble that electrodes have been substituted. These also have given trouble caused by the formation of scum in the stilling wells. This has been eliminated by a device developed by the Bureau of Engineering. This consists of a plastic tube, to the bottom of which is attached a flexible rubber ball filled with clear water, which is inserted into the stilling well. As sewage enters the well, the static pressure it exerts on the ball forces the water in it to rise inside the tube to the same level as the sewage outside. By inserting in this tube electrodes attached to insulated wires, the operation is the same as though the electrodes were in the sewage itself, but without any trouble caused by scum. The first one installed has operated for a year without any maintenance being required.

"Trouble-Free Sewage Pump Controls". By E. G. Studley, Engr. of Sewer Design. *Water & Sewage Works*, November.

Refuse Disposal By County Cooperation

In Putnam County, Ohio, an association has been formed to operate a sanitary landfill, which is used by nine villages and six townships, each of which pays to the association approximately 50 cents per capita of its population. The association contracts the operation of the landfill. This is located on a 20-acre site of land owned by the

Each of the 8 Gar Wood Load-Packers used by Uniondale Garbage & Disposal Co. is equipped with two salvage racks. Into the hopper rack go rags and scrap iron picked out as the crews dump waste into the bucket. Rack over cab holds waste paper which householders bundle for easy handling. Although waste paper is worth little today, each ton salvaged cuts about $5 in incineration costs.

FASTER SERVICE, LOWER COSTS reported by refuse collector using compaction-type units

When Sherman VanNess and George McCahill went into the waste disposal business eight years ago, they used open trucks just like those owned by other collectors in Uniondale, New York. But, as costs rose due to general inflation, the new company had to find more economical collection methods.

"Looking for a way to cut overhead," writes Mr. VanNess, "we studied waste collection systems in other cities and villages. We found many had switched to modern compaction-type equipment. *Almost 200 Gar Wood Load-Packers* were used in our county (Nassau) alone!* A check of their operating costs convinced us that here was the best solution to our problem."

Tried 1, bought 8

"With a loan from our local bank, we bought our first Gar Wood Load-Packer. We liked it so well we now own eight.

"With this equipment, our crews load much more waste per truck and load it faster and easier! Our labor, travel and operating costs have decreased, while our service to customers has improved through more sanitary handling."

Need 1 man less per crew

Residents of Uniondale are no longer subjected to such annoyances as unpleasant odors, blowing paper and trash. Fully enclosed Load-Packers have provided faster service, too . . . the larger capacity of their compaction-type bodies has greatly reduced the number of trips to the dump, and thus kept crews on collection duty more hours per day. And they have proved so easy to load that Uniondale Garbage & Disposal Co., now makes collections with a 2-man or 1-man crew per truck, instead of the 3-man or 2-man crews usually used in this area.

Save $4 yearly per home

"This speed has let us add an extra garbage collection for residential customers," says Mr. VanNess, "we now make 3 *collections of garbage and 2 of rubbish per week.* (Our commercial collections, made once every weekday, remain the same.) And, the costs are lower than ever. Each of our 4,000 residential customers pays *only $24 per year.* That's $4 to $12 less than the amount paid directly, or through taxes, by residents of any other town or village in this area . . . even though our company must pay taxes, license fees, *and* $1 more per ton for incineration than paid by any other community in the neighborhood.

"Two of our competitors quit the business because they couldn't match this service and price, without Load-Packers. Our third and last competitor had to buy a Load-Packer to keep up with us."

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Sherman VanNess, partner in Uniondale Garbage & Disposal Co., believes activity in civic and fraternal organizations helps cement good relations between public servant and taxpayer. A former fire chief in this village of 20,000, he today is chairman of the board of fire commissioners, assistant fire inspector of Nassau County, a member of the Uniondale Board of Trade, and a member and director of Kiwanis International.

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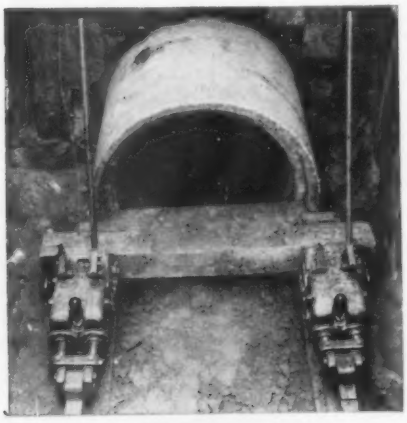

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county, the haul to which ranges from 2 to 15 miles for the several villages. The trench system is used.

"Sanitary Fill Experiences in Ohio". *PUBLIC WORKS*, December.

Disposal of Sludge By Dilution

Where sewage sludge cannot economically be transformed into usable end products, there are several alternative methods of disposing of it. One of these is wastage into large bodies of water. This method is acceptable when bacterial decomposition in digestion tanks has changed the solids into a relatively homogeneous matter with significantly less oxygen demand and lower pathogenic content — a substance amenable to ready dispersion when mixed with volumes of water. Reconstitution of digested sewage sludge with a primary effluent so it can be discharged through a common outfall may reasonably be accomplished in almost all instances where primary effluents are now being disposed of adequately to lakes, rivers or oceans. It may be desirable, where this would jeopardize health or violate safety standards, to construct a separate outfall for this diluted sludge; but such outfall could be a comparatively small pipe and could be placed economically to the distance and depth necessary to insure satisfactory disposal.

"Disposal of Digested Sludge by Dilution". By A. M. Rawn, Chf. Engr. and F. R. Bowerman, Div. Engr. Los Angeles Co. San. Dist. *Sewage and Industrial Wastes*, November.

Moving Grit in Treatment Plants

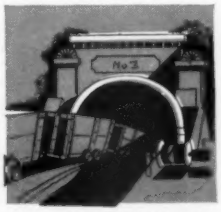
The sewage treatment plant of Auburn, N. Y. receives the discharge from combined sewers, which naturally contains considerable amounts of grit. No grit-removal facilities had been included in the plans, and most of the grit settled in the flocculating basin, while it also became a problem in the sedimentation basins and sludge incinerator. In 1953 the flocculating basins were converted into grit chambers. To remove the grit from these, they installed four "Aer-Degritters", which lift the grit into an open channel sloping to a hopper. From the hopper it is lifted to a height sufficient to discharge it into a truck by means of a Hapman tubular conveyor. This device is new in the sanitation field but is used by many industries for transporting flowable particulate matter. This consists of a tube—3-in. in diameter at Auburn—through which moves an endless chain the links of which alternate with disks which fit closely in the tube. This continuous tube passes across the bottom of the hopper, where an opening in the top permits the grit to enter it; then around a 90° corner and a 45° vertical bend to the highest point, where an opening in the bottom permits the grit to fall out. The chain travels continuously at a speed of 5 ft. per minute, which permits the grit to be dewatered as it travels uphill. The only difficulty experienced in operation has been the freezing of the grit in the tube, which is being remedied by wrapping heating coils around the exposed tube.

"Grit Handling Made Easy". By James M. Symons, Graduate student, M.I.T. *Water & Sewage Works*, November.

Treating Institutional Sewage

Sewage from state institutions in California differs in some respects from municipal sewage; that from mental hospitals, for example, often contains torn sheets, silverware and other matters thrown into the toilets by patients. The rates range from 125 to 250 gpd. Special methods described in this article include treating salt-water sewage, hillside spraying, storage at small pumping stations, and ponds for septic tank effluents. San Quentin prison uses salt water for flushing toilets and this constitutes about 50 percent of the sewage. It was found that, in spite of the salt water, the sewage could be treated on a high-rate filter and removal of BOD as high as 90 percent obtained. The sludge gives excellent results as fertilizer for lawns. At three state parks, effluents from septic tanks are sprayed onto adjacent hillsides through trickling filter nozzles. At some small pumping stations it is necessary to provide storage for a large part of a day's sewage. At one station, this storage was provided by burying 300 ft. of 36-in. pipe below the level of the sewer that discharges into it; the cost was only 60 to 65 percent as much as of a conventional storage basin.

"Sewage Treatment in California State Institutions". By Edwin R. Stowell, San. Engr., Div. of Architecture. *Sewage and Industrial Wastes, November.*



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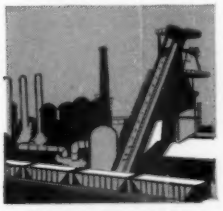
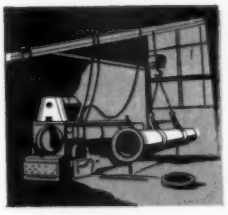


Blast Furnaces



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Effects on Soil of Sewage Irrigation

A laboratory test of the comparative effects of sewage effluent and tap water on six different soils was conducted for 18 months at the University of Texas in 1952-1953. Relatively small changes were noted, and it was concluded that sewage irrigation is neither especially beneficial nor injurious to soils. It encourages accumulation of chlorides, but these are easily leached out. There is a slight increase of organic matter (humus) and of pore space; also of phosphorus and boron.

"Effect of Sewage Irrigation Upon Soils". By Ernest W. Steel and E. J. M. Berg, Univ. of Texas. *Sewage and Industrial Wastes*, November.

Utilization of Digester Capacity

Of several units of loading of sludge digesters in use, the author prefers "pounds of volatile solids per cubic foot per day". He cites the pilot plant at Iowa City, where there was continuous recirculation of digester gas through centrally located gas diffusers, where a loading of 0.345 units was handled successfully, and compares this with 0.036 units, which is calculated to be the equivalent of 3.0 cu. ft. per capita. This applies to the biological digestion in tanks; supernatant separation, and sludge concentration and storage can be conducted more economically in simple holding tanks or lagoons. The digestion itself requires only about 55 hours; a detention period of 7 to 10 days should provide an adequate safety factor. Daily loadings of 0.2 lb. volatile solids per cu. ft., and even greater, are feasible.

"Efficient Utilization of Digester Capacity". By Philip F. Morgan, Prof. of San. Eng. Univ. of Iowa. *Sewage and Industrial Wastes*, November.

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Other Articles

"Organization for **Refuse Disposal** in San Antonio". By Guy Browning Arthur. Public Works, December.

"Modern Design Features **New Incinerator**" at Baltimore, Md. By W. P. Fannon, Bureau of San. Public Works, December.

"Controlled Humus Production" by digestion and drying as a manufacturing process. By Leonard L. Langford, Pacific Flush Tank Co., Water and Sewage Works, November.

"Pollution in a Tidal Stream". Determining the maximum loading by evaluating local factors. W. T. Laffey, Hercules Powder Co. Water & Sewage Works, November.

"Controlling Water Supplies and Sewage Disposal in **Subdivisions"**. By M. Warren Cowles, Health Officer, Hackensack, N. J. Public Works, December.

"Pharmaceutical Waste Disposal". By A. Gallagher, L. J. Keefe, S. A. Mayer and W. D. Hanlon, Bristol Laboratories, Sewage and Industrial Wastes, November.

"Treatment of **Machine Shop** and Foundry Wastes". By C. W. Hathaway and R. E. Harvie, Metallurgical Dept. Chevrolet Motor Div. Sewage and Industrial Wastes, November.

"Treatment of **Sulfur Mine** Waste Water". A new and novel process. By J. W. Schwab and D. C. Edmiston, Texas Gulf Sulphur Co., and G. T. McBride, Jr. Asst. Prof. of Chem. Eng., Rice Inst. Sewage and Industrial Wastes, November.

"Construction and Maintenance of **Industrial Sewers"**. By Ernest K. Smith, C. E., Eastman Kodak Co. Sewage and Industrial Wastes, November.

"Card Record Systems for Preventive Maintenance". By John T. Norgaard, Murray B. McKinnie, Warren R. Uhte, Melvin J. Wise and Elmer E. Ross, Superintendents of several California plants. Sewage and Industrial Wastes, November.

"Cause and Control of **Detergent Frothing**—A Review". By Benn Martin, Dept. of Pub Wks., San Francisco. Sewage and Industrial Wastes, November.

Speed Data Provided by Radar Checks

JEROME D. FRANKLIN,
Traffic Engineer,
City of Grand Rapids, Mich.

DURING the spring of 1953, with the purchase of a radar timing device, it was possible for the Grand Rapids Traffic Engineering Division to make a study of the speed and traffic problem which faced us on many of our more-traveled streets, primarily those leading to and from the suburban areas. In most cases, these roads are State Highways and are speed-zoned to the city limits from 45 to 35 miles per hour. However, at the city limits, the existing signs usually called for a 25-mile speed limit, according to our local and state traffic ordinances, which unfortunately have no bearing whatsoever on the culture of the surrounding land, and the existing speed of the vehicles. Accordingly, with the cooperation of the Grand Rapids Police Department, radar speed checks were made at 37 different locations. These included checks at each of the entrances to the City, on some highways entirely within the City which approached limited access, and on our one-way streets.

Several hundred observations were made at each of the locations, both the top speed and the 85-percentile speed being recorded; and at the completion of the survey, a program was adopted where in almost every instance speed limits were increased to 30, 35 and 40 miles per hour, and then properly speed-zoned to a reduction to the standard 25 miles per hour limit where warranted.

At the request of the Superintendent of Police, a follow-up study was made of these locations approximately one year later. It was interesting to note that in each location rechecked, there was practically no differentiation in either top speed or in the 85-percentile speed.

Speed checks were made and recorded on 28 streets in 1953 and on 35 in 1954; on 26 of these, checks were made in both years. Of these 26, the 85-percentile speeds showed an increase during 1954 on 11 streets and a decrease on 14; there was no change on one street. For the most part, the changes were small. In top speeds, higher speeds were shown on 14 streets in 1954 and lower speeds on 10 streets, with one the same as in the previous year.

Extended study of these speed checks show that the greater majority of the motoring public will drive at speeds which it feels are reasonable and proper, despite posted speed limits; and, in most cases, when these signs are placed only after factual speed studies are made, there is much more respect paid to them by the driver. Contrary to most criticism of an increase in the speed limit, the higher speed signs will not in themselves really increase the speeds already found.

Bridge Flooring of Corrugated Metal

H. L. DITTMER,
County Engineer, Warren, Ohio

WE have replaced 36 bridges with new structures, using corrugated steel decks and have rehabilitated six old bridges with new steel stringers and the corrugated decking. We have not placed any steel decking on wooden stringers. When we had to renew the old wooden stringers we felt that it was more economical from the maintenance standpoint to install new steel stringers.

There is nothing complicated in the laying of corrugated steel decking either on wooden stringers or steel stringers. In one case you use a screw bolt to tie the decking closely to the wooden beams. In the other case you weld the decking to each and every steel stringer through the holes made by the manufacturer or provided by burning these holes in the field.

In order to get a satisfactory job, the steel decking needs to fit snugly to each and every stringer and the way to get this close fit is to lay the flooring all ready to weld, then bring a loaded truck on the bridge, thus forcing the decking down on the stringers so that all of the decking makes contact with the stringers underneath. Then, while the truck is still in place, preliminary fastenings are made.

After we have completed the welding, we thoroughly clean the decking and give the surface a coat of rust-resistant paint. Then we are ready to put on the bituminous top. First we lay a prime coat of hot asphalt or tar; then we place plant mix asphalt in two layers—the first covering the decking about ¾ in. level over the top which rolls down to about a covering of ⅜ inch; then applying the second coat which should roll down to about 1 in. compacted at the outside edges and about 2½ in. in the middle, so that the surface water will drain off.

This is an abstract from a paper presented at the ARBA National Highway Conference of County Engineers and Officials.

Civil Air Patrol Uses Portable Electric Plant

● **THIS 1000-WATT Kohler electric plant is a key part of the communications equipment of the Civil Air Patrol at Sheboygan, Wisconsin. Plant supplies power for the mobile radio transmitter-receiver that enabled the ground crews to keep in touch with patrolling aircraft, and can be used also for emergency lighting when needed.**

PUBLIC WORKS DIGESTS

THE WATER WORKS DIGEST

The Largest Prestressed Tank

The largest prestressed concrete water tank constructed to date has recently been put into service at Dallas, Texas. It is 98 ft. 6 in. inside diameter and 35 ft. high; supported on a 2 ft. thick reinforced concrete slab resting on four concentric ring walls which rest on rock foundation, elevating the tank 77 ft. above grade. The exterior ring is fluted for architectural effect. New features introduced into the design by the Preload Co. include rubber pads at the top and bottom of the tank wall to reduce the vertical moments caused by the horizontal prestressing and by the filling of the tank with water. The 8-in. tank wall was prestressed circumferentially by the wire winding method.

"Largest Tank of Its type". By J. J. Closner, vice-president, The Preload Co. *Engineering News-Record*, Oct. 28.

Ion Exchange Membranes in Water Analysis

The analytical laboratories of the Permutit Co., which make more than 1200 tests of water per month, are making an intensive study of the phenomenon of electrodialysis utilizing ion exchange membranes. As an illustration of its operation, if a cation exchange membrane separates into two chambers a vessel containing salt water, the sodium ions move freely through the membrane in both directions, but the chloride ions cannot pass through the cation membrane and remain in the original chamber. If a small electric field is applied, the sodium ions will move through the membrane only in the direction of the negative electrode and finally all will accumulate on one side of the membrane, leaving the equivalent hydrochloric acid on the other side. Using a multichambered cell partitioned with both cation and anion membranes, a stream of seawater can be continuously divided into pure water and highly concentrated brine at comparatively small cost.

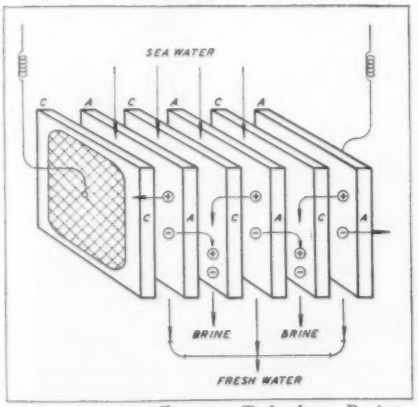
"Water Analysis Is Big Business". *Public Works*, December.

The Ratio Method Of Population Forecasting

The ratio method has won wide acceptance in many fields as the best shortcut means currently available for forecasting city populations. Its application requires three fundamental operations: 1. Computation of the local-to-national population ratio in 1950, 1940, and perhaps several earlier census years. 2. Extrapolation of the trend indicated by these ratios to some future date. 3. Application of the projected ratio to an existing forecast of national population for the year in question. There are many ways to project the local-to-national ratio, all subject to an error of 5 to 15 percent when checked by actual figures of past censuses. Checking the forecasts made for 20 cities by the various methods as of 20 years ago, the comparative and geometric methods were in error by over 60 percent; the arithmetic method, 18.8 percent; the ratio method, 15.6; and the logistic method, 10.6 percent.

Discussing this paper, C. C. Elder, hydrographic engineer of the Metropolitan Water Dist. of Southern California, said that the U. S. population forecasts have been in error by as much as 30 percent, due to population movements caused by depressions and boom conditions. The ratio in Southern California has ranged from 0.28 percent in 1890 to 3.8 percent in 1954. However, the ratio method is an important tool, which works best when qualified by judgement and discretion and accompanied by considerable luck. No method should be relied on dogmatically, particularly in unusual migration areas like the Pacific Coast States.

"Forecasting City Population by the Ratio Method". By Robert C. Schmitt, Cons. Sociologist, Honolulu Redevelopment Agency. *Journal AWW Assn.*, October.



Courtesy Technology Review

● ION-SELECTIVE membranes, C, permit passage of sodium and other positive ions, while membranes, A, pass only negative ions.

Fresh Water From Sea Water

Sea water is 96.5 percent pure water. Various methods are available for separating the pure water from the salt, but the cost of most of these make them prohibitive except under unusual circumstances. From the second law of thermodynamics it can be deduced that the minimum amount of power required to separate 1,000 gal. of fresh water from sea water is 2.8 kwh, and this can never be bettered by any process yet invented, even at 100 percent efficiency. At a cost for current of 0.5 cent per kwh, the power cost alone would be $0.028. Adding plant costs, the best that can be hoped for is a total cost of $0.084 per 1,000 gal. of fresh water.

The methods of obtaining fresh water which have been proposed are based upon vaporization; solar distillation; freezing; use of chemicals; electrolysis, including use of ion-selective membranes. Dozens of others which are not considered practical are based on the use of very high temperatures, solid adsorbents, ultrasonics, electrostatic

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effects and others. The author gives the following estimated costs, in dollars per 1,000 gal. of pure water, on the basis of 0.5 cent per kwh for power, steam at $0.60 per 1,000 lb., and fixed charges at 15 percent per year. Multiple distillation, $3.80; vapor - compression distillation, $1.70; solar distillation, $2.85; freezing, $0.75 to $1.25; chemical precipitation, $30.00; ion-exchange resins, $20.00; resin membranes, $0.75 to $1.00. About $0.40 is the top figure that communities now pay. As the value of crops raised on irrigated land averages only $0.10 per 1,000 gal. of water used, fresh water from sea water is impracticable for irrigation.

"Fresh Water From the Sea". By Thomas K. Sherwood. *Technology Review*, November.

Revenue Bond Financing

The financing of waterworks improvements by water revenue bonds has become a widely accepted practice; cities in at least 38 states are permitted to issue such bonds. In general, the interest rates on such bonds is up to 1.5 percent higher than on similar-term general-obligation bonds. G. W. Francis considers that one of the greatest needs in the field of revenue bond financing is uniformity in legislation throughout the various states, based upon a model act. L. W. Grayson believes that the individual utility should strive to develop a sound basic bond issue pattern to its circumstances; and continue to follow a pattern which it has found to result in favorable sales.

"Survey of Water Revenue Bond Financing". Joint discussion of paper abstracted in our June issue. *Journal AWW Assn*, October.

Making Brackish Water Palatable

A Saline Water Conversion program has been provided for by the State legislature of South Dakota, which has appropriated $2,000,000 for a 5-year study. Early in 1955 experiments will be begun with the water supply of Miller, which has a high-solids content of almost 2,000 ppm, to develop a process for demineralizing the water to 350 to 500 ppm at a cost that would be economically feasible for communities. The method used at Miller will be developed by Ionics, Inc., using selective membrane filters.

"Experiments For Making Brackish Water Potable". By Charles E. Carl, Director, Div. of San. Eng. *Public Works*, December.

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Radioactivity in Treatment Plants

A study of the efficiency of rapid sand filtration plants in removing fallout radioactivity was made at three water plants. This showed that within about 2 weeks after a nuclear detonation, approximately 45 percent of the gross long-range fallout radioactivity entering had passed completely through the plant; and by 10 weeks, about 53 percent had passed through. Following this, practically all the remaining radioactivity gradually passed through. In no case did the measurement of radioactivity exceed the emergency levels set. The equipment and technique described in the paper should be applicable to measurements of radioactivity whether caused by fallout, reactor wastes, accidental spills into surface water supplies, or contamination due to sabotage.

"Passage of Nuclear Detonation Debris Through Water Treatment Plants". By Carlos G. Bell, Jr., Asst. Prof. of C. E., Northwestern Univ.; Harold A. Thomas, Jr., Assoc. Prof. of San. Eng., Harvard Univ.; and Barnett S. Rosenthal, Lawrence Experiment Station. *Journal AWW Assn,* October.

Use of Fluosilicic Acid in Baltimore

When, in 1952, Baltimore, Md., decided to fluoridate its water supply, it selected fluosilicic acid as the source of fluoride ion, rather than sodium fluoride, sodium fluosilicate or hydrofluoric acid. There were several reasons for making this selection—less total annual cost; less hazard in handling; less labor; less space required for storage. The annual cost for materials, interest and amortization on equipment, and additional labor needed was estimated to be $203,141 for sodium fluoride; $184,959 for hydrofluoric acid; $105,134 for sodium silicofluoride; and $62,559 for fluosilicic acid. Use of salts would require storage room for 225 drums, accurate dust-tight feeding devices; dust masks and special clothing for the personnel; additional men for feeding a ton a day of the salt; and ventilation of the rooms where the salts are handled. For using an acid, two 5,000 gal. rubber-lined steel storage tanks are required, and proportioning pumps for handling the liquid from tank to filter. (Milton Roy pumps were used, having a plastic head, glass valves and Hosteloy plunger). During 1953, 1492.6 tons of fluosilicic acid was used, costing $76,210; and the total cost, including a special laboratory assistant and interest and depreciation on equipment, was $93,286.

"How Baltimore Fluoridates". By Edward S. Hopkins, Prin. Assoc Engr. Bureau of Water Supply. *Water and Sewage Works,* November

Disposal of Softening Plant Sludge

Marion, Indiana, softens its water by the lime soda ash method, using 2 sludge-blanket type softening units with a total capacity of 8.4 mgd, and 4 rapid sand filters. About 9 tons of lime and 2.3 tons of soda ash are used each day, and the sludge amounted to 200,000 gallons a day. At first it was discharged into a gravel pit; then into a lagoon; and, as these filled up, into the river during high water. But the Indiana Stream Pollution Control Board notified the city that 20,000 cu. ft. of sludge had been deposited on the river bed and requested an immediate remedy. The only remedy that seemed practicable was recalcination and reuse, as practiced at Miami, Marshalltown and Lansing. A glass bottle manufacturing plant investi-

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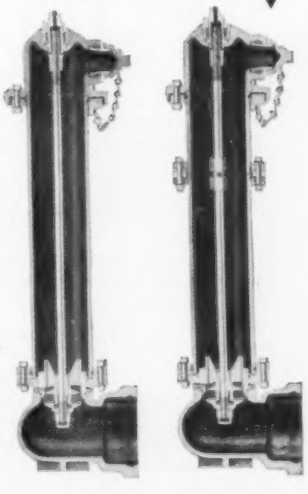

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gated the possibility of drying the sludge with waste heat from their plant, then using the calcium carbonate in glass-making operations; but the iron content was too high for this purpose.

Marion's experience leads them to advise that any plans for lime-soda softening include adequate facilities for sludge disposal. Lagoons and gravel pits may suffice for small cities; should be far from residential areas; should be cleared of trees and so constructed that they can occassionally be dried and cleared with conventional equipment.

"Disposal of Softening Plant Sludge Plagues Marion, Ind." By E. Stuart Savage, Supt. *Water Works Engineering*, November.

Peacetime Emergencies

Disasters due to war are more terrible than those occurring in peace time, but the latter are much more probable, and preparation for them is important. Tornado damage during the fall of 1954 demonstrated this. The author describes the experiences of two Michigan water departments during two tornados in 1953, and on the basis of these, names several preparatory features which should be considered. These include: 1. Readily usable equipment records and distribution maps, and accurate descriptions of pumping and other equipment. 2. Safeguarding key facilities. 3. Providing duplicate or standby equipment. 4. Have available certain other equipment, such as emergency chlorination apparatus and testing kits; tank trucks for bringing water; two-way radio and mobile telephone. 5. Provision for increasing the chlorine residual of water leaving the plant. 6. An inventory of available auxiliary water supplies, and provisions for making interconnections. 7. Training personnel so as to have a substitute in case of accident to any key operator.

"Preparation for Peacetime Emergencies". By T. L. Van der Velde, Chief, Water Supply Sec., Michigan Dept of Health. *Journal AWW Assn.*, October.

Taxing Underground Water

On July 30, 1954, citizens of Orange County California began paying a tax on water pumped from wells, believed to be the first tax of this kind ever levied. The conditions there are unusual. The ground water basin in Orange County, as in many other localities, has been so badly over-drawn that seawater has encroached into it. The supply has been and is being replenished by spreading Colorado River water on selected spreading grounds. So far, 162,042 acre-feet has been purchased and spread, and the cost is to be met by taxing all supplies withdrawn by wells at the rate of $3.50 per acre-foot. State legislation adopted in 1953 authorizes this and provides for future purchases of amounts necessary to maintain the water level, estimated to be 100,000 acre-feet per year at present.

"Orange County Inaugurates First Tax for Pumping Water From Underground Basin". By Howard W. Crooke, Sec'y Orange Co. Water Dist. *Western City*, October.

Emergency CD Equipment Solves Water Shortage Quickly

Bel Air, Md. obtains its water supply from a surface stream and five wells. In July, 1954, the combined quantity furnished by these failed to meet the demand and the water company hauled water by tank trucks from nearby communities. This soon became inadequate, and on July 20 the town engineer asked the State Dept. of Health for assistance. A plan for obtaining a

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supply from other surface sources was formulated and permission obtained from the Maryland Civil Defense Agency to borrow equipment allocated to it by the Federal Civil Defense Administration; and on July 22 an agreement was approved in Washington for obtaining 2 pumping units, 3 portable 100 gpm diatomite filter units, 2 collapsible nylon water storage tanks, and 8,000 ft. of 8-in. steel pipe to connect the pumps to a hydrant in the Bel Air distribution system. This equipment began arriving the next day and pipe was laid on the 24th. On July 27th, filtered water was being delivered at the rate of 300 gpm.

"Emergency CD Equipment Solves Water Crisis at Bel Air, Md." By Holmes Orgain, San. Engr., Maryland State Dept. of Health. *Water Works Engineering*, November.

Other Articles

"Hydrant and Valve Maintenance in Small Plants". By Francis H. Connors, City Engr., Van Wert, Ohio. Journal AWW Ass'n, October.

"Pumps—Types and Principles". By George E. Symons. Water & Sewage Works, November.

"How **Reclamation** Reduces Steel Plant's Water Make-up". By James Joseph. Water & Sewage Works, November.

"Valves for Water Works Applications: Selection, Operation and Maintenance". By Robert C. Kauffman. Water & Sewage Works, November.

"Water Supply for Steel Works (the Fairless Works) Involved Big **Pumping Plant**". Water Works Engineering, November.

"New Water **Record and Billing** System Streamlines Service". By Lendon F. Dutton, Supt. of Utilities, Groton, Conn. Water Works Engineering, November.

"Modern **Water Rates**" in ten cities. American City, November.

"A Decade of **Fluoridation**". By W. L. Harris, Supt. of Water and Light, Grand Rapids, Mich. Journal AWW Assn, October.

"For Large Size Water Meters—An **Electronic Tester**", used at Long Beach, Calif. Public Works, December.

"Wise Planning Cuts Costs of Water Works Addition" at Arlington Heights, Ill. By E. J. Knudsen, Public Works, December.

"Cross-Connection Hazards and Protection". By H. A. Spafford, State Dept. of Health, Ill. Journal AWW Assn, October.

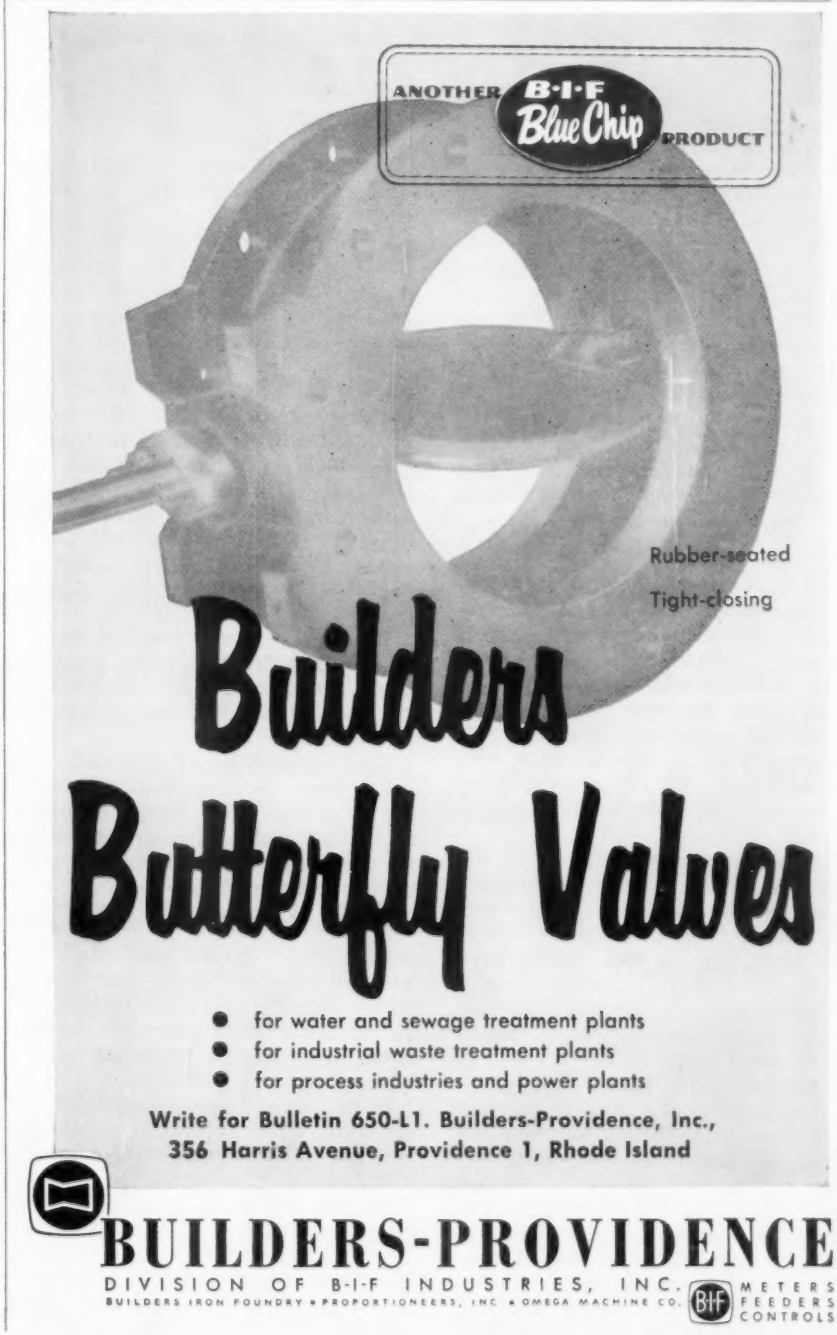
"Fundamentals of Water Works Operation: Water Supply", by Lawson D. Matter, Pa. State Dept. of Health. Clarification and Filtration", by Martin E. Flentje, AWW Service Co. "Pumping", by Victor A. Appleyard, Chf. of Water Operations, Philadelphia; "Distribution", by George F. Eynon, Mgr. S. Pittsburgh Water Co. Journal AWW Assn, October.

"Distribution System **Maintenance in Cold Weather"**. Care and Maintenance of Hydrants", by H. H. Behlmer, Supt. Water Dept. Fargo, N. D.; "Thawing of Frozen Pipes", by Paul Buccowich, Jr. Supt., Light & Water Dept., Ely, Minn. Journal AWW Assn., October

• • •

Centralizing Public Works

The League of Wisconsin Municipalities has made a survey of the public works operation of cities and villages in that state. The extent to which public works have been centralized is shown by the following data: In 40 cities and 15 villages which have a director, commissioner or superintendent of public works, responsibilities of such officer are: Streets, 39 cities and 15 villages; waste disposal, 33 cities and 11 villages; sewage disposal, 26 cities and 11 villages; park maintenance, 18 cities and 11 villages; and supply, 16 cities and 14 villages; and building inspection, 11 cities and 8 villages. Among the advantages cited are maximum utilization of equipment through interchange of use, and the coordination of personnel.



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Safety for The Water Works Industry

HAROLD L. LONDO
Superintendent, Water Department, Green Bay, Wisconsin

THE WATER WORKS industry has been lagging in the establishment of safety programs, a condition often attributed to public ownership of two-thirds of all water departments. It is said that public employees are the only large group of workers in the country who are not now practicing safety. Although 80 percent of the publicly owned water departments may be classified as small businesses, employing from one to ten people, their managements have not been alerted to the need for safety.

What is safety? Du Pont states: "Safety might be defined as a happy condition of man and plant, created through personal effort directed to the goal of conserving manpower through the elimination of man-made mistakes, commonly but erroneously referred to as accidents." We must be taught that safety means "good housekeeping" in the broadest sense of the term. Management and workmen alike must realize that carelessness and sloppy housekeeping are the prime reason for most accidents.

Case Histories Reported

A canvass of fifteen Water Departments in the State of Wisconsin has uncovered a variety of accidents which have occurred recently. The superintendents were asked how these accidents happened and how they might have been avoided. Here are some selected case histories and the superintendents' comments as reported to the author:

A piece of steel chipped off the busting end of our pneumatic hammer and became lodged in the side of the operator. Cause: Poor reconditioning job on tool. Could have been avoided by a more careful examination of the tool before using it and rejecting it for one in good condition.

Strained back. Cause: The operator of a pneumatic hammer strained his back while lifting the hammer from one portion of the hole to another. This could have been avoided by lifting the tool correctly. The operator was tired at the time and should have rested himself before lifting heavy equipment.

[In checking accidents one will note that many of them occur late in the day when men are tired or are hurrying to complete a job before quitting time. It is then that the supervisor should exercise special care to see that the job is done safely.]

Trench laborer. Contusion, laceration and fracture of thumb. Cause: While digging a ditch he struck his thumb against jagged pavement. Could have been avoided by the exercise of greater care both by the workman and by the supervisor.

Meter reader. Bite, right 4th finger. Cause: while waiting at a door a squirrel ran down his arm and bit his finger. No comment from the Superintendent, but the use of meter readers less attractive to squirrels is suggested.

Operating Engineer. Contusion and strain of muscles and ligaments in left chest wall. Cause: while pulling on a rope block the rope hitch broke, causing him to fall against a gate. Could have been avoided by checking equipment before use, and, in this case, substituting new rope.

[As a sidelight at this point, it may be noted that in a survey of the agencies involved in accidents in the Detroit Water Department, hand tools, materials and working surfaces accounted for more than two-thirds of the total. In over half of the accidents workers were either: 1) pushing, pulling or striking; or 2) lifting, lowering or carrying.]

In a great many accident cases foreign particles in the eyes are reported. Almost all of these could be avoided by the use of safety goggles.

One superintendent reported "It would seem that poor footing, causing slips and falls; back injuries; and dirt or other foreign material in the eyes are the chief sources of our accidents."

Chlorine Safely Handled

Only one report mentioned a man being gassed by chlorine fumes while changing a chlorine tank. Apparently the use of gas masks while doing this type of work has been accepted by our workmen.

A serious and somewhat unusual accident which occurred recently resulted in the loss of an eye by a member of a construction crew. This man was guiding traffic thirty feet away from a crew cutting a length of pipe with chisels. Despite this distance, a flying chip of metal struck the side of his face and was imbedded in the eyeball. A sheet metal guard around the place where the men were cutting the pipe probably would have prevented the accident.

In my own Green Bay department, in the past two years, we have had two accidents resulting in broken toes which could have been avoided by the use of safety shoes. Another lost time accident occurred while making a 6″ x 6″ tap. While pouring lead around the sleeve it began to leak around the clay. A workman (who should not have been in the trench in the first place) reached between the legs of the man pouring the lead to press the clay tighter around the sleeve. Just then the clay blew, and this man's hand was severely burned. We found that the clay being used had not been kneaded sufficiently to work out the excess water, and as a result, steam formed which caused the joint to blow. This accident could have been avoided by the use of proper care in preparing materials. Also, the man pouring the lead should have stopped this and tightened the clay around the joint himself. When the accident occurred the man in charge of the job had just left to check some other phase of his work.

The comment of one of the Superintendents reporting is pertinent. He states "My feeling in the matter is that good supervision is the best form of accident prevention. While individuals can be given lectures on safety and all that sort of thing, I find from a good many years of experience that the workmen are prone to become careless and forget the things that they have been told. Therefore, I say again that the Superintendent or Foreman on the job is the important man in the Safety Program."

• • •

Guidance for Disaster and Emergencies

To cover four types of emergencies, a disaster plan has been prepared by Eau Claire, Wisc., and a manual issued to establish a standard operating procedure. The four types of emergencies are: (1) Severe storms, as tornadoes; (2) major fires; (3) floods; and (4) enemy air attack. The city manager has the responsibility for placing the plan in operation. Essential departments of the city are allotted tasks, as are local radio and TV stations, telephone and power utilities, CAP, amateur radio operators, the National Guard and the ground observer organization.

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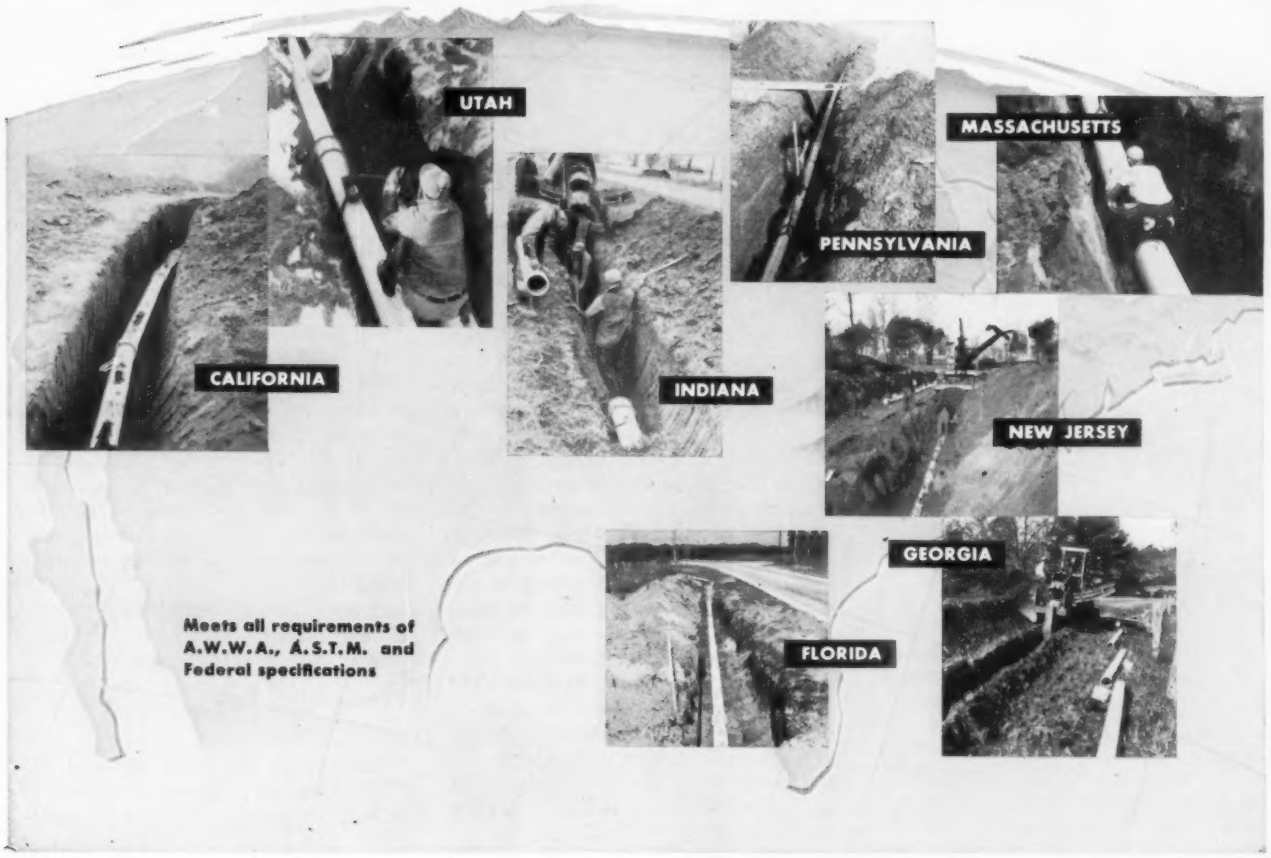

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PUBLIC WORKS DIGESTS

THE HIGHWAY AND AIRPORT DIGEST

Financing City Streets

The annual congress of the American Public Works Assn., held last September, devoted an afternoon to a symposium on urban street financing. J. P. Buckley, Chief Engr., Automotive Safety Foundation, reported that 37 percent of the states are required to allocate part of their highway revenues to cities; Maryland 25 percent, California 37 percent, Connecticut 41 percent, Michigan 40 percent. The present annual construction investment by cities of about $400 million is only partly met by state contributions. Bond financing for expressways and other urban highway developments had, he said, five advantages:

1. Bond financing permits accelerating construction of high first cost facilities, needed now and offering great economic benefits.
2. Permits development of an integrated system at one time, rather than piecemeal improvements.
3. Street deficiencies may be so acute that needed reconstruction cannot be financed otherwise.
4. Bond financing apportions the tax fairly well in line with user benefits.

Pay-as-you-go financing in many cities will not provide a solution to the traffic problem in the present generation.

Disadvantages of bond financing are that (a) bonds draw interest, (b) bonding power may be needed more urgently for another facility than streets, (c) issuance of bonds may be over-done, i.e., theoretically may encourage over-construction.

"How to Finance Better Streets". *Roads and Streets*, November.

New Ideas in Turnpike Paving

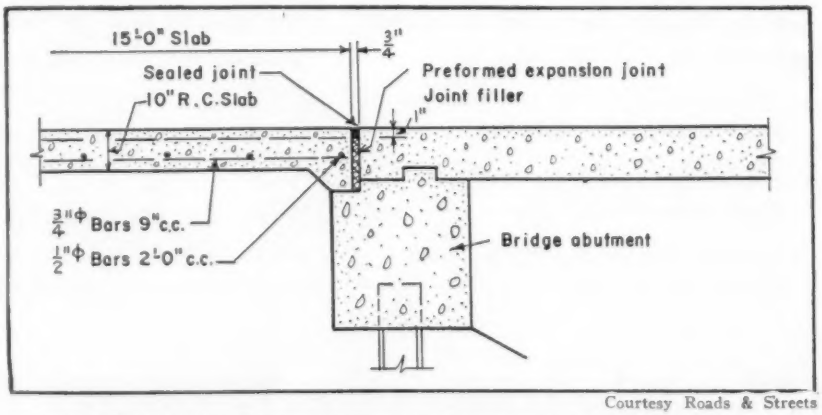
This article describes the construction methods employed by three contractors in paving 80 miles of the 241-mile Ohio Turnpike during 1954. The record rate of 7,015 ft. of 10-in. by 12-ft. lane in a 13-hr. pouring day was reached by V. N. Holderman & Sons, which used two batch plant set-ups on the 14.7 miles of their contract, the move being done by 5 or 6 trailers in carefully rehearsed stages, only a single day of paving being lost. For form grading, two Cleveland formgraders were used as a team, a crawler supporting the outer end of each machine; which traveled always forward, saving turnarounds. An International shoe-type vibrator compacted the sub-base to 6-in. depth in a single pass. The concrete for this lift was placed by a 34-E dual-drum paver, and a second similar paver placed the second lift. Radiotelephone played an important part, the contractor using 28 mobile Motorola units.

Among the design features are noted the following: Each of the dual two-lane roadways consists of 10-in by 24 ft. reinforced concrete on a granular sub-base 6 in. deep. On the east end air-cooled crushed and screened slag is used as coarse aggregate. For reinforcement either welded wire mesh or welded bar mats is permitted; all the contractors have elected to use the mesh. At bridge ends, a 15-ft. special slab design includes closely spaced 3/4-in. bars in the axis direction, the slab resting on the bridge seat to insure against uneven settlement. Where the two 12-ft. lanes are placed at once, contractors may either form or saw the center joint; to date, all have chosen the sawing method. Either hot or cold rubber asphalt seal is permitted; all contractors have chosen cold rubber. Offered the choice of either paper or water curing, all are using paper mats.

"New Ideas Help Contractors Speed Ohio Turnpike Paving." *Roads and Streets*, November.

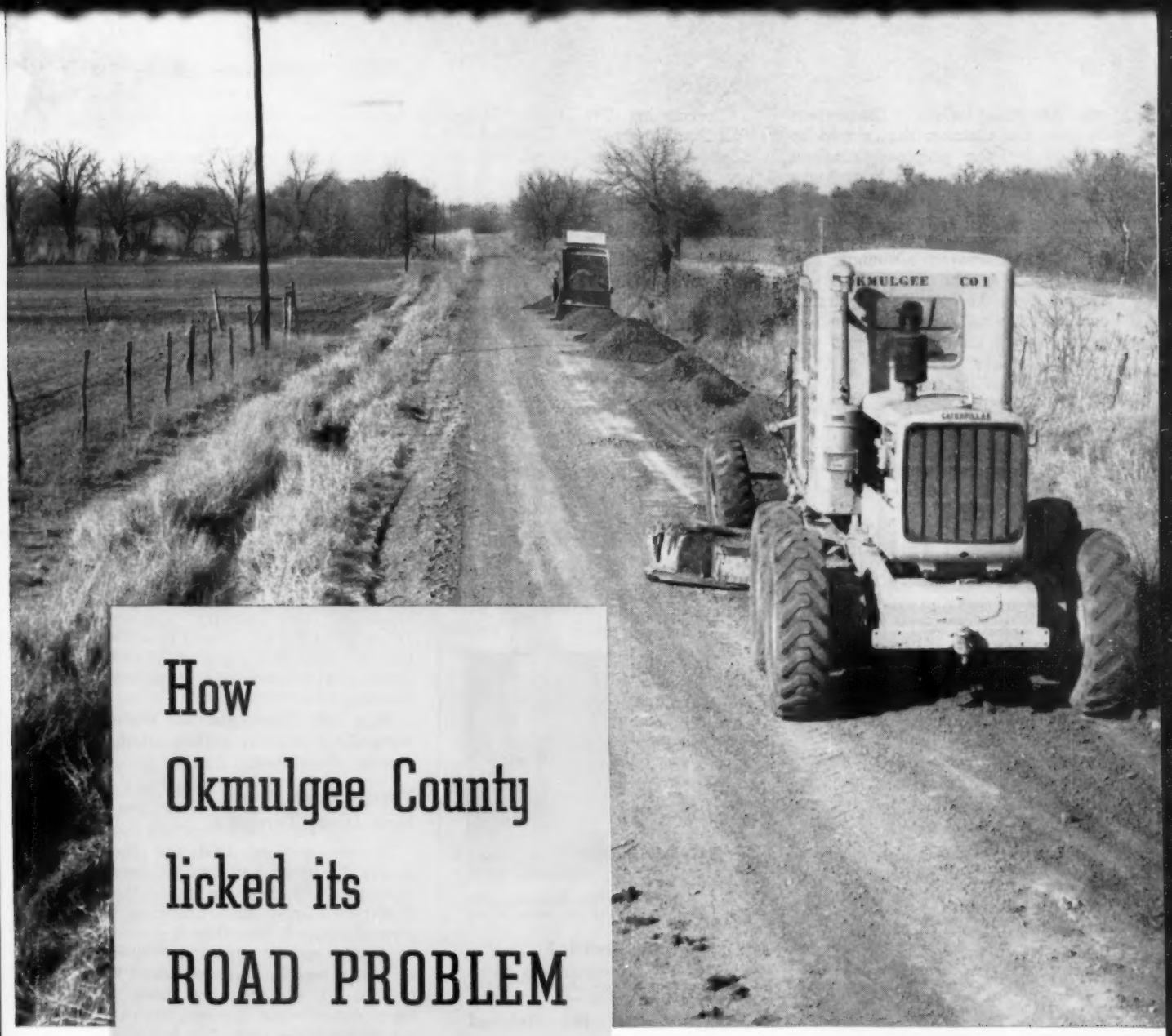
Forecasting Toll Road Traffic

Estimating the need for and income from a proposed toll road is a very important feature of planning and one which requires a recognized specialist whose report will aid in selling the bonds for financing the turnpike. This article describes in detail how such estimate was made for a projected turnpike in Iowa. Origin-and-destination surveys were made at 41 stations which formed 8 north-south screen lines. Also automatic traffic counters at each station operated around the clock for 14 days or longer. Time and distance figures were worked out for all routes that would compete with the proposed



Courtesy Roads & Streets

● **DETAILS of reinforced pavement slab at ends of turnpike bridges.**



How Okmulgee County licked its ROAD PROBLEM

Fourteen years ago in Okmulgee County, Okla., Commissioner H. A. Heck took office . . . and took stock. An alarming proportion of the county's District 1 roads were impassable. But there were two CAT* machines in the county garage. Mr. Heck went to work.

Today folks in Okmulgee can get where they want to go: more than 250 of the district's 327 miles of road have been graveled, and Commissioner Heck is still on the job.

On the job with him now are not two pieces of Caterpillar equipment, but half a dozen. Spreading gravel in the picture here is one of them, a Caterpillar Diesel No. 12 Motor Grader.

Mr. Heck says, "Caterpillar equipment is the best a county can buy." Some reasons:

The No. 12 is built and serviced entirely by one organization — engine, transmission, frame and circle assembly, and controls. Its cylinder liners, crankshaft journals and many other parts are "Hi-Electro" hardened to give long, trouble-free work life. Its constant-mesh transmission shifts easily and fast through working speeds from 2.3 all the way to 21.5 m.p.h. Its 115 HP is all there, and it uses low-cost fuel, such as No. 2 furnace oil, without fouling. The complete unit is truly *balanced* — power with weight with speed.

Mr. Heck makes another point: "Getting parts is no problem." Not with a Caterpillar Dealer always ready with prompt service and complete parts stock. He'll be glad to show you why this big yellow machine is best for your own job, too. Ask for a demonstration.

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one. Assigning values to the savings in time and distance that would be offered by the proposed road, a reasonable toll schedule was worked out. Using the data so collected and traffic counts for 15 previous years kept by the Highway Commission by automatic recorders, an estimate was made of the traffic to be expected, and this combined with the toll schedule gave an estimated income; and the amount of this available for debt service, assuming bond interest at 3.5 percent, told what cost of the turnpike was feasible.

"Forecasting Traffic for Future Toll Roads". By J. P. Chamberlain, *Engineering News-Record*, November 25.

Bituminous Stabilization of Soil

This article is a brief but comprehensive presentation of the subject. It discusses conditions necessary for successful use; the types and grades of bituminous material most suitable; thickness of bituminized layer. Describes how to pulverize the soil and apply the bituminus material, with mixing and aeration; and methods of compacting and finishing; ending with construction of a wearing surface.

"Soil Stabilization With Bituminous Materials". By Leo J. Ritter, Jr. *Public Works*, December.

Use of Chemicals In Winter Work

Reports by highway officials in eight states are given in a Forum article. Each of them uses rock salt or calcium chloride to treat abrasives, which are stored in stockpiles in the open or in dry shelters. Inside storage is recommended, but they have had little difficulty in handling or loading treated abrasives when they are stockpiled in the open. Some departments place small stockpiles or boxes of treated abrasives on hills, at curves and intersections or other dangerous spots for the use of motorists and truckers. One county engineer thinks it would be cheaper to stockpile dry sand in a dry place than to treat it with chemicals to prevent freezing.

"Use of Chemicals in Winter Works". A Forum article. *Better Roads*, November.

Traffic Control on New Jersey Turnpike

By the end of 1953 the New Jersey Turnpike had handled more than 41,000,000 vehicles, more than 22,000,000 during 1953. Contrary to general opinion, less than 6 percent of traffic on the turnpike travels its entire length, although about 65 percent of the vehicles using it carry out-of-state licenses, indicating that a large part of it has destinations within the state. Seasonal traffic patterns closely follow those of other major highways in the region. On Aug. 1, 98,021 vehicles used the turnpike—as high as 1400 vehicles per lane per hour, one section nearly 44 percent above its design capacity. The density was even greater than these figures indicate, since increase in numbers is accompanied by reduction in average operating speed. Although the vehicular mileage in 1953 was 13 percent more than in 1952, there were 18 percent less accidents. The fatality rate was about 60 percent of the national rate. This is attributed to design, enforcement and publicity. No traffic crosses at grade, sight distances are long, shoulders wide, there are adequate acceleration and deceleration lanes for entering and exiting traffic. Traffic regulations are enforced by 77 State Police, with one patrol car for each

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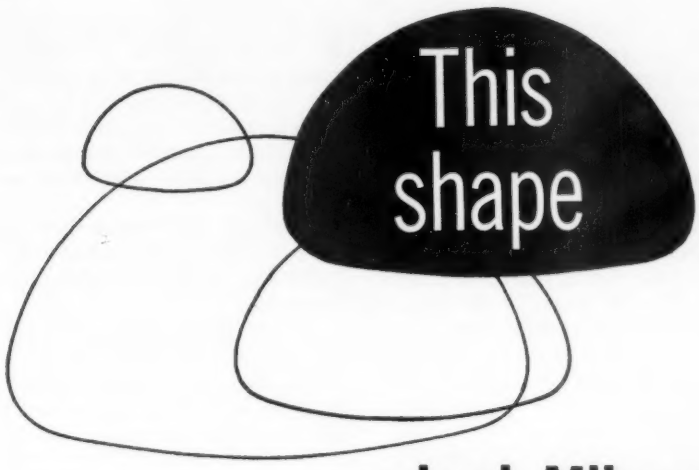

solved Milwaukee's sewer problem

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9 miles of turnpike. The signing program is comprehensive, including regulatory signs, warning, informational and directional on the turnpike, and routing signs throughout the state directing traffic to it. The Turnpike Authority is constantly studying to improve the signing program.

"Traffic Control and Operations on the New Jersey Turpike". By John R. Crosby, Asst. Traffc Engr. *Public Works*, December.

Climbing or Truck Lanes

Virginia Highway Dept. is increasing the carrying capacity of its highways by constructing climbing lanes on hills, to be used by commercial vehicles which have to slow down on up grades. Use of these results in a satisfactory movement of traffic, with greater roadway capacity and negligible delays, with considerable savings to traffic in time and operating costs, and reduction of accidents caused by passing maneuvers. They are used by 95 percent of the heavy vehicles. Climbing lanes are considered to be warranted on two-lane highways where the hourly traffic exceeds 400 vehicles, 10 percent or more of which have dual rear tires, and the grade exceeds 5 percent for a distance of 1/4 mile. The lanes are made 10 to 12 ft. wide, of normal pavement design, preferably of a color contrasting with that of the other lanes.

"Truck Lanes Help Solve Virginia's Traffic Problem". By Herbert R. Perkinson, Jr., Asst. Traffic & Planning Engr. *Public Works*, December.

Striping Parking Lots

Fort Sam Houston, Post Engineers, finding painted stripes on parking areas to have high first and maintenance costs, have developed a raised asphaltic stripe and a machine for applying it. This machine supplies asphalt by a distributor pump through a connection to a hand hose. As the machine is pushed forward, it applies asphalt in a strip of the desired width as set on the machine, covers the strip with aggregate, and rolls the completed stripe with the rear wheels. The asphalt stripe is similar to a seal coat 4 in. wide. Clean, hard aggregate uniform in size should be used contrasting with the pavement after extensive use. Hard, white crystalline aggregates for white lines, and black trap rock for black lines have been most satisfactory. Such stripes made by the small striping machine cost approximately half as much as paint stripes placed by small line painting machines and have much longer life.

"Economy in Parking Lot Striping". By Gordon W. Dabney, H'way Engr., Fourth Army. *Public Works*, December.

Other Articles

"Development of **Road Tunnels** in Britain". By J. Koll. Contractors Record, Oct. 13.

"First **Soil-Cement Streets** in Kentucky and First Use of New Financing Law". By N. W. Neal, City Eng'r, Henderson, Ky. Public Works, December.

"World's **Longest Over - Water Bridge**", 15 miles long, the Sunshine Skyway, south from St. Petersburg, Fla. By G. Blair White. Roads and Streets, November.

"Getting a New Lay-Down on **Asphalt Pavement**". By G. A. Meskal, Asst. Maint. Engr., Minn. Dept. of H'ways. Roads and Streets, November.

"**Mechanical Spreading** of Precoated Chippings on Cold Asphalt". By S. Maynard Lovell, Co. Engr., West Riding of Yorkshire, England. The Surveyor, October 9.

"**Bituminous Paving;** New Procedures for Hauling and Placing". By Vaughn Marker, Asst. Constr. Engr., Calif. Div. of H'ways. California Highways, September-October.

"Standard Plans and Specifications for **Curbs, Gutters and Sidewalks**", of Garden City, Kansas. Public Works, December.

"**Financial Problem** Is Most Baffling One of All" for Pennsylvania. By E. L. Schmidt, Sec'y of H'ways. Better Roads, November.

"**State-County Relationships** in Wisconsin". By W. L. Haas, State H'way Com'n, Better Roads, November.

"**Snow Removal** and Treatment of Icy Pavements". Reprint of pamphlet by Highway Research Bd. Roads and Engineering Construction, October.

"**Effect of Rubber** on Asphalt". Summary of report by U. S. Bureau of Public Roads. Roads and Engineering Construction, October.

• • •

Unusual Revenues for Water Works

The Hartford, Conn. Water Bureau last year received revenues from two rather unusual sources. One, from the forests on its watersheds, is by no means unique, but the cities which have such source of revenue are limited in number. The other, in the shape of fees charged for permits to pick blueberries on

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reservoir property, is certainly an uncommon one. In July and August, 1953, $867 was collected for such permits at $1 per person.

The district owns 30.5 square miles of watershed, which is forested scientifically under a long-range program. In 1953 it received $4,388 from the sale of standing timber, $6,390 from the sale of logs; $792 for cord wood, and $360 from miscellaneous wood sales. During the year it transplanted onto the watersheds 58,800 trees.

Compacting Trenches and Small Areas

The "Compaction Handbook" is an excellent small text, written by Thor Groswold, edited by E. F. Taylor and available on request from Gunderson-Taylor Machinery Co., 1237 Shoshone St., Denver, Colo. The following data are taken from this text.

As a result of scientific soil investigation, special compaction equipment has been developed which will produce in the field the stability obtained in the laboratory. For compaction of large volumes of soils over large areas, sheeps-foot and rubber-tired rollers are now standard equipment. For smaller projects or more restricted areas of large projects, different types of tampers are available which are powered with air, electricity or gasoline engines.

The engineering properties of soils, such as stability, resistance to settlement and permeability are directly related to their density or degree of compaction. Density can be expressed in pounds per cubic foot and generally an increase in the density means improvement in the engineering properties of the soil. When the soil is properly compacted, air in the soil mass is displaced by the soil particles, and the soil mass has a smaller volume. Moisture is used as a lubricant and the compaction energy increases the density by reducing the volume.

Two different compaction tests are recognized as standard, depending on the type of soil being investigated:

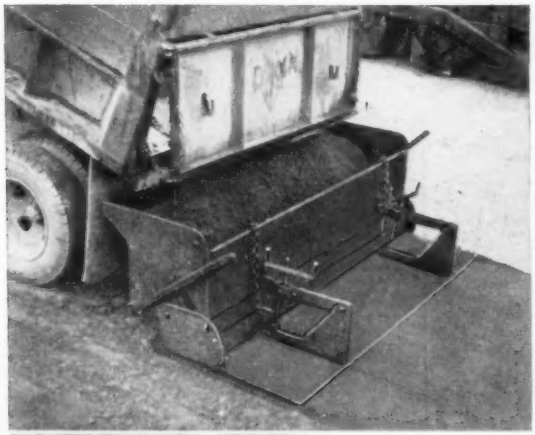
A. The standard test for non-free-draining soils applies to soils which contain a sufficient amount of silts and/or clay to render them impervious, thus preventing water from draining through, and from, the soil. This test is known as the Proctor Test.

B. The standard test for free-draining soils applies to soils which consist of clean gravel and sand and which are pervious, thus permitting water to drain freely through, and from, the soil. This is the Relative Density Test.

Most specifications for backfill compaction of non-free-draining soils require a maximum of 95 percent of standard Proctor Maximum Density.

It is always advisable to have the soil on any construction site investigated by a soil laboratory in order to obtain knowledge of the physical properties of the soils present. This avoids needless costs during construction and often prevents damage to the structure after completion. Such soil investigation amounts to protective insurance for all parties.

A soil laboratory will furnish not only the information of the soil properties, but also charts showing the standard Proctor Maximum Density curve and the desirable moisture content applicable to the soil. Also included will be Penetrometer readings of the various tests. These Penetrometer readings are important in that they (in most



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Lightweight—easily moved and maneuvered on job site.

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instances) provide a means for checking backfill compaction in the field in an easy and convenient manner.

Compaction Energy and Moisture

The delivery of compaction energy at the construction site is most important. There are a number of powered backfill compaction tools which are especially suited to smaller and restricted areas where heavy equipment cannot be maneuvered. Among these is the Triplex backfill tamper which was developed by Gunderson-Taylor. Standard single tampers are used in this, three of them being combined into one unit. The result is a design which increases the man-hour production of compacted material by about five times. It does this by combining pounding with vibration. While especially suited to non-free draining soils, free-draining soils are also compactable. Control of compaction is possible through the use of the Penetrometer which checks Proctor density. For free-draining materials, control of compaction must be accomplished through field and laboratory tests.

Tests have shown that 95 and 100 percent Proctor Maximum Density can be obtained at the compaction rates of 12 and 5 cubic yards of compacted material per hour per triplex tamper, respectively. The influence of moisture content on the densities obtained is about the same as for other types of compaction. The efficiency of the tamper is greatly influenced by the thickness of the compacted layers. The optimum thickness of soil layer for compaction is 5 to 6 inches loose and 3 to 4 inches compacted.

Tests show further that, in free draining soils, 80 and 90 percent relative density can be obtained at the rates of 22 and 10 cubic yards per hour of compacted material respectively. In order to obtain the best compaction, the material directly below the tamper should be continually wetted during and preferably before compaction. The tests indicate that the above relative densities can be obtained when compacting 24-inch loose layers. Probably 36-inch layers could also be efficiently compacted.

This unit is efficient for compacting smaller areas, including backfill around foundations, to prevent cracking of walls and footings, around parking and traffic areas, to prevent settlement and cracking of surfacing; around heavy equipment foundations; at culverts, to prevent settlement, erosion and washouts; at bridge abutments; on side grades of limited steepness—up to 20°; and at catch basins. It is especially useful for compacting sewer, water and other ditch excavations. It will compact backfill of all kinds, including free-draining sands and gravel which are often specified as backfill on such projects.

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County Water Supply

(*Continued from page* 78)

reports, notes, financial agreements, contracts and correspondence. This concern has been retained for years on a fee basis, and handles all designing and planning for the county system.

The department employs 38 persons, with 7 crews on the distribution lines. Every employee is required to attend for one week the school maintained by the State Board of Health jointly with the Georgia Institute of Technology. A. E. Lane, Filter Plant Operator, runs the supply system in general, including the filter plant. He has been with the city for 26 years, always working with General Manager Weaver, and is one of the thoroughly grounded and alert water specialists.

When the county took over the Decatur water system it agreed to establish the minimum rate at $1 for every 5000 gallons. The rate for the county outside the city was fixed at $2 per 5000 gallons. Any change in rates was to remain on the 2:1 ratio. But in 1948 the county rate was cut by allowing 6000 gallons, to equalize rates with Atlanta.

Benefits

The story of this DeKalb County Water System is only half told when the plant is described. The immediate effect of starting the plant amazed even the most sanguine advocates. An area admirably suited to residential development was suddenly freed from the limitations of a waterless back country.

New streets and highways were started everywhere. People in Atlanta looking for suburban homes within easy driving distance seized upon the new area with accelerating vigor, and the county population began to zoom with startling speed. New stores and better buildings rose in Decatur. New shopping centers began to grow in almost houseless sections. Anyone could live in DeKalb County, shop there, get to

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Three well defined industrial areas soon took form on the three important railroads of the South. The best firms in the country, using Atlanta as their southeastern distributing center, found in DeKalb County the sites they had been looking for. The list is too long to quote in full, but such firms as General Motors, American Hospital Supply, Allis-Chalmers, Burroughs Adding Machine, J. I. Case, Carborundum, John Deere, Eastman Kodak, Frigidaire, Gates Rubber, B. F. Goodrich, Jewel Tea, Kraft Foods, Studebaker, Westinghouse and Plantation Pipe Lines now have some of the best looking modern plants in these new industrial spots that can be found anywhere in the country.

One result of this industrialization in well restricted sections is an impressive movement of employees from Atlanta to the residential developments in DeKalb County. The spiral continues upward; more industries, more employees, more homes, more schools, more stores, more cars, more churches, more movies.

Since the beginning of the DeKalb County plan three other counties in Georgia have followed with more or less similar programs. Cobb County, joining with Marietta, its county seat, has a plan in operation. Clayton and Gwinnett counties have programs in preparation.

DeKalb County isn't what it used to be. No one stops to think how it used to be. Not many people who are there now can remember. But once upon a time some courageous and forward-looking men started a new water plant up on the Chattahoochee River. They meant to get water for a parched back country in which there were few people because it wasn't comfortable to live there. When the water began to flow through new pipe lines to all parts of the county the project snowballed until it made a county in which it is good to live. Nothing but a supply of good water did it.

• • •

Detergents

(*Continued from page* 96)

synthetic but typical Oak Ridge National Laboratory laundry waste show the difference in treatability between different types of detergents. In the past, this laundry waste has contained about 2000 ppm of citrate and 1000 ppm of Igepal CO Extra. The effect of Igepal, a nonionic detergent, on trickling filter slimes was compared with the anionic detergents Tide (synthetic) and Rinso (soap) to determine whether it was feasible to use relatively expensive nonionic wetting agents rather than common anionic detergents. The chemical nature of Igepal permits it to function as a detergent under a greater variety of conditions than is possible for the ordinary synthetic detergents, most of which are anionic. Igepal is also capable of supplementing the action of cationic and anionic detergents. The lime-soda dispersing power of Igepal also stands far ahead of many well known synthetic detergents, and it is an efficient wetting agent throughout a wide range of acidity, alkalinity and temperature. Results of these tests indicate that the anionic detergents Tide and Rinso will not reduce trickling filter operations providing the concentration of detergents is kept well below 100 ppm. Larger concentrations will certainly increase the organic load and create operational difficulties. Igepal, however, does not register a BOD, nor does it appear to be antagonistic toward trickling filter slimes in concentrations below 250 ppm. Apparently the detergent passes through a filter without being attacked by microorganisms. In a laundry waste 1000 ppm of Igepal reduces the BOD removal about 30 percent from what would be expected if the waste did not contain the nonionic detergent. Foaming is apparently one of the major problems produced by Igepal.

Effects of Complexing and Chelating Agents

Citrate complexing in flocculation processes at Los Alamos caused some interference;[30] however, citrate is readily available for use by a variety of microorganisms commonly found in trickling filter slimes.[13] Slimes grown in rotary tubes removed 82 to 21 percent of the BOD from solutions which contained 66 to 2000 ppm of citric acid, as citrate, at a pH of 6.9 to 2.8 respectively. The applied BOD of the two citrate solutions were 334 and 1311 ppm. The range of BOD removals was 40 to 50 percent when the pH was adjusted to 2.8 for a solution containing 500 ppm citrate with a BOD of 461 ppm. Rotary tubes, receiving applications of 500 to 4000 ppm of citrate, with BOD ranging from 495 to 2920 ppm and

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with adjusted pH of 7.0, removed 81 to 31 percent of the BOD.

Versene, an effective chelating agent, although registering no apparent BOD of its own, affected the slime structure when concentration reached 125 ppm. As shown in Figure I, the introduction of 250 ppm of Versene to a waste caused a collapse of the existing slime structure. The recovery of the slimes to reestablish equilibrium was rapid, but the BOD removal was about 30 percent less than that previously attained while treating a similar waste minus the Versene. Another detrimental property of Versene was that slimes could attach themselves to a surface only after the surface was precoated with microbiological growth. There appeared to be considerable competition between the surface active bacterial cells and the surface active chelates. This surface effect which Versene exhibited upon raw rock surfaces was also apparent with detergents, but to a lesser extent.

Discussion and Conclusion

Laundering operations, especially radioactive decontamination processes, produce unstable organic wastes. If the waste is toxic and contains difficult to stabilize agents, it is necessary to integrate the laundering and laundry waste control program. It may be wiser to use biological-oxidizable cleaning agents, even though in some cases they are not as efficient in removing contaminated dirt and soil as compared to a lesser amount of a very complex non-oxidizable but efficient compound. A saving in waste treatment and stream pollution may justify the use of more treatable wastes.

Whether efficient nonionic wetting agents or biological-oxidizable anion detergents should be recommended for use in a laundering process depends, among other things, upon (1) the capacity of the waste treatment plant; and (2) the assimilation capacity of the final diluting body of water. It is better to use a detergent in a laundering process that is oxidizable, especially if a waste treatment plant is capable of handling the extra organic load. If the waste treatment plant, however, cannot handle the extra organic load, it is better to use a nonionic detergent such as Igepal. If Igepal is used in laundering processes, it will pass through the treatment unit, and its toxic effects, if any, will be experienced in the diluting body of water. Such a method of detergent disposal in reality will depend upon the dispersion and dilution capacity of the receiving stream.

The dilution capacity of a stream may be dependent upon the future use of the receiving water as well as immediate toxic effects upon aquatic life. For example, it has been shown that synthetic detergents in concentrations as low as 3.6 ppm are capable of producing rancid tastes when chlorinated.[31] In areas such as the Southwest, where water for diluting purposes is at a premium and where water must be reused, it may be desirable to use soaps or oxidizable synthetic anionic detergents in lieu of difficult to treat synthetic detergents. The carbon in most soaps can be utilized in biological oxidation processes, and in this manner some of the problems occasioned by some synthetic anionic and most nonionic detergents are eliminated.

It is doubtful whether the relatively expensive wetting agents used in laundries, households and some industrial processes have sufficient advantages over soaps and other anionics to warrant their use in light of the possible effects which they may have on treating drinking water and maintaining a normal balanced aquatic population. Although it has

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been reported that no health hazards exist as a result of the increased use of synthetic detergents, it has also been reported that the phosphorus content of domestic sewage is approximately twice what it was before the advent of synthetic detergents.[32][33] This increase in phosphorus may be sufficient fertilization to cause profuse plant growth in streams of limited flow.

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PUBLIC WORKS
EQUIPMENT NEWS

Published Monthly **January, 1955**

New Spreading Pattern Helps Snow and Ice Removal

Echelon spreading of salt, cinders, sand and calcium chloride is provided in a new unit introduced by Highway Equipment Co., Inc. In addition to ice and snow control, this spreader will spread for seal coats. It is built to fit any truck body, and attaches to the truck frame, eliminating any weight on the body. This Model J is said to spread wet or dry materials, from fine sand to 1-inch stone, forward or reverse. Shifting is automatic, and there are no controls to install in the truck cab.

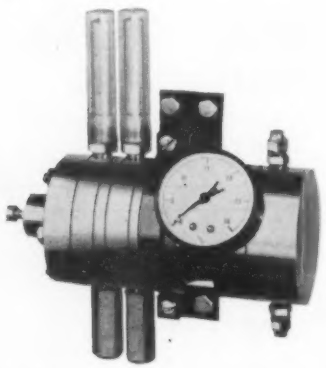
Echelon spreading is said to have the advantage of laying the material in ridges, traveling with the traffic. Under the ridges, the ice or snow melts more quickly, permitting the brine to get underneath. This kind of spreading also readily identifies dangerous places where it is necessary to spread salts or sand, warning traffic to slow down. The unit will operate at speeds to 30 mph; it is attached in less than five minutes and it does not interfere with the use of tire chains. More from Highway Equipment Co., Inc., 616 D Ave., NW, Cedar Rapids, Ia., or circle No. 1-1 on the coupon.

Echelon spreading pattern results in effective use of salt and abrasives

Pneumatic Transmitter for Water and Sewage Uses

A simple, sensitive transmitter, designed especially for water filtration, sewage and low pressure industrial service is compact (only 7 in. long, 3 in. diameter, and 4 lb. weight), operates on the force-balance principle, and delivers a pneumatic output pressure, changes in which are exactly proportional to changes in loading pressures. The output may be a direct or inverse function of a single loading pressure or of the difference or sum of more than one such pressure. Small diameter tubing between the transmitter and the remote instrument conveys the pneumatic signal which actuates the instrument mechanism. It measures rate of flow, loss of head, liquid level, and pressure (up to 35 psi).

Additional advantages claimed include easy, inexpensive installation at the point of measurement, rapid response, no wear or friction, overload safety, negligible fluid displacement, and low maintenance. For further information, write Builders-Providence, Inc., 345 Harris Ave., Providence, R. I., or circle No. 1-2 on the coupon.

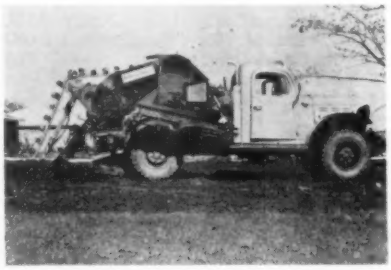


BalanCel can measure pressure, rate of flow, loss of head or liquid level

TRUCK MOUNTED DITCHER HAS ALL-WHEEL DRIVE

For mobility and all-around service, Barber-Greene has mounted this ditcher on a Dodge 4-wheel drive truck, giving such advantages as fully enclosed operator's cab, lights, regular truck steering and a 45-mph speed. This model, the 711, can be equipped with either of two digging booms, one for 5-ft. depth, the other for 42 ins. Either boom is adaptable to digging 8½, 12, 15 or 18 ins. width. Change involves only removal of one set of teeth and cutter bar and the substitution of a set of the desired width. Forward ditching speeds provide an infinite range from 0 to 13 fpm; and, in addition, there are three bucket line speeds which are independent of crowding speed.

All of the machine controls can be handled by the operator while seated in the cab; or he can operate them from a standing position alongside the machine. Overhead clearance is low. In operation, the overall height is only 6 ft. 8 ins., and the boom may be carried for a short distance in a position which does not exceed this height; for longer hauls, a greater clearance is required. Discharge is to either side or to the back, using an auxiliary conveyor. More from Barber-Greene Co., Aurora, Ill., or circle No. 1-3 on the coupon.



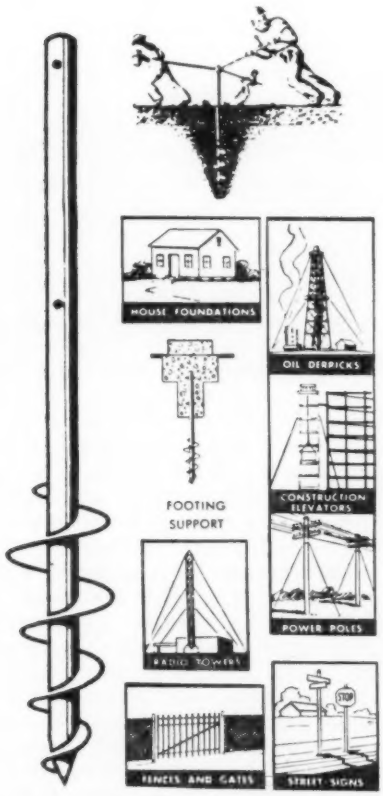
B-G ditcher features easily adjustable digging widths from 8½ to 18 ins.

Electromagnetic Hammer Drill for Concrete and Masonry

A new addition to the Syntron line of Electromagnetic hammer drills can drill up to 3-inch diameter holes. A new design is said to speed up drilling in masonry and concrete. A special feature is a rubber ratchet mechanism which utilizes the recoil of each blow of the hammer piston to turn the bit slightly. Thus the 3600 blows per minute of the hammer piston rotates the bit with suitable torque at the right speed, eliminating the manual quarter turning of a drill bit, etc. More information from Syntron Co., Homer City, Pa., or circle No. 1-4 on the coupon.

Pier Anchor for Any Kind of Tie-Down

Equipped with a pointed steel body with tapered flanges, this EZY pier anchor pulls itself into position when turned and locks itself into the earth. The holding power of the EZY is increased by the screw's action of packing soil tightly around the blade as it descends. As a result of this action the surrounding soil is made more compact. Design of the blades will not allow any upward movement of soil but instead it is compressed to the sides and between the blades. The EZY is made in a considerable range of sizes and can be turned to the desired depth of penetration by adding extensions. You will find many uses for this anchor. For the average installation only 15 to 20 turns are required, the operation taking only 5 to 10 minutes. Complete data from Van Dyke Industries, 3625 Cahuenga Blvd., Los Angeles 28, Calif., or circle No. 1-6 on the coupon.



Applications of the EZY pier anchor. Units are easy to install and remove

Service Bodies for Water, Sewage and Street Work

All-new service bodies provide arrangements suited for every municipal department

An all-new line of Morrison Service Bodies has just been introduced. These fit 40 different Chevrolet, Ford, Dodge, Studebaker, GMC and International chassis, ½, ¾, 1 and 1½-tons, single or dual wheel. There are a total of twenty-five new features of these Morrison service bodies. Outstanding are bonderized, all-steel welded construction with double lap-type joints; 18 different compartment arrangements; extra-large compartments which are lockable with all doors keyed alike; completely weather-proof compartments through the use of lap seals and gutter drains on all doors; 25 to 35 square feet of floor loading area; non-skid floor; hinged fender panels for easy access to wheels and spring shackles; and a complete line of new service accessories which can tailor any truck to the specific service, maintenance and construction needs of any public utilities. Complete information, including specifications and prices are available on request from Morrison Steel Products, Inc., 601 Amherst Street, Buffalo 7, New York, or circle No. 1-5 on the coupon.

Roto-Trowel for Smoother Concrete Surfaces

This rotary trowel for concrete surfacing has a stationary guard ring with which the machine can be picked up. The engine, which is 2 hp, is disengaged from the drive when the operator lets go of the handle, a safety feature which also permits rest periods for the operator. The pitch of the blades can be controlled while the machine is in motion. Blades are of wear-resistant material and construction is such that unusually smooth surfaces are regularly obtained. More from Stow Mfg. Co., 290 Shear St., Binghamton, N. Y., or circle No. 1-7 on the coupon.

Hydraulic Hoist for 1-Ton and Smaller Trucks

A new hydraulic hoist, designed for installation on ½, ¾ and 1-ton trucks, can be mounted under any pick-up body, any platform body up to 9 ft. in length or any light duty Galion Allsteel dump body up to 8 feet long. Rated capacity of the hoist is up to 4 tons. Suitable for installation on trucks having cab-to-axle dimensions of 46 to 60 inches, it provides a dumping angle of 40 degrees. Location of the twin 3 inch ram-type hoist cylinders is ahead of the truck's rear axle. More information from Galion Allsteel Body Co., Galion, O., or circle No. 1-8 on the coupon.

Fast dumping and positive control are features of Galion Model 334N hoist

"STREET KING" SWEEPER FEATURES NEW DESIGN

In addition to a pleasing appearance, with two-tone color combinations if desired, this new sweeper has many improvements. Design provides a balanced pressure on the brooms, and these can be operated whether the unit is cruising, just moving or is stopped. The size of the dirt hopper is 4 cu. yds.;

cruising speed is 25 mph; water capacity is increased to 250 gals. The conveyor system utilizes an automatic belt trainer, reducing or eliminating the necessity for belt adjustments. Complete data on this new sweeper is available from Elgin Sweeper Co., Elgin, Ill., or circle No. 1-9 on the coupon.

Endpoint Indicator Can Control Cation Exchangers

A new electronic control utilizes the fact that, as the downflow hydrogen zeolite ion exchanger approaches exhaustion, the pH of the effluent has a higher conductivity than that of the upstream sample. This fact is used to indicate the end of the operating run. Equipped with proper electrical controls, this device, called the Enditrol, can be used for automatically initiating the operation of existing automatic regeneration equipment. Or it can be equipped with bell or light signal to indicate the end of a run. It also is equally applicable to anion exchangers used for silica removal. More from Permutit Co., 330 West 42nd St., New York 36, N. Y., or circle No. 1-12 on the coupon.

For Electrical Utilities—an Aluminum Alloy Cable Pulley

It is claimed by the manufacturer that this aluminum alloy cable pulley has reduced installation time of aerial cable by as much as 75 percent. The weight is less than 25 lbs., making placement and handling easy. It is designed for a cable load of 600 pounds and requires only 8 ins. of pole length. Design is intended to allow the lineman, at the first attempt, to position it properly on the pole by hand prior to securing it with a wrench. For more data write J. S. McConnell, Maxwell Equipment Co., Milford, Conn., or circle No. 1-10 on the coupon.

The Ima generator, a 1000-watt power plant, can be used either for standby emergency duty or for routine service on construction jobs, farms, camps, resorts, etc. It is easily hand carried. Special features include throttle locks for continuous operation, a 1-gal. auxiliary gas tank and a factory-set governor. Further information from Mall Tool Co., 7725 S. Chicago Ave., Chicago 19, Ill., or circle No. 1-13 on the coupon.

Portable generator delivers 120-volt 60-cycle AC current; rating is 1 KW

High-Pressure Steam Cleaning Unit

An improved version of Model 250 high-pressure combination cleaner is now available from Malsbury Mfg. Co. This can produce pressures up to 300 psi and deliver 20 to 33 1/3 percent more solution through its larger ¾ in. I.D. coils. Because of its increased cleaning impact, it is claimed that it will clean much faster, effecting a saving on labor and equipment downtime. This machine uses a pump for pressure, enabling the user to get 300 lbs. pressure without even lighting the burner. Five distinct cleaning actions and capacities are also possible; control is by the use of two valves on the control panels. Units may be oil- or gas-fired. More data from Malsbary Manufacturing Co., 845 92nd St., Oakland 3, Calif., or circle No. 1-11 on the coupon.

High-pressure Malsbury steam cleaner quickly removes dirt and grease from tractor

Fork-Lift Attachment for Tractors Handles Many Materials

A fork lift attachment for tractors for mechanized material handling on off-pavement surfaces, has been announced by Sherman. The unit was originated by the K-D Manufacturing Company, Cleburne, Texas, and developed further by the Sherman engineering staff. It is designed for use on Ford tractors. Its ability to operate on unpaved or rough terrain brings the advantages of mechanized material handling to jobs which cannot utilize the standard industrial fork lift truck.

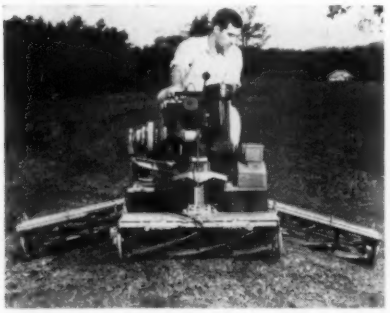
The attachment operates hydraulically. It will lift a load up to 4000 lbs. 10 ft. into the air. Power steering is provided as a standard feature. In addition to the lift forks, attachments include a crane, angle dozer, scoop bucket, concrete bucket and concrete block forks. Literature is available from Sherman Products, Ind., Royal Oak, Mich., or circle No. 1-14 on the coupon.

Improved Mall Chain Saw

This new 29-pound chain saw has fast cutting speed, balanced lightweight design and engineering modernity. It cuts fast through hard, soft, wet or frozen wood. Its power, size, and price make it practical for use on all types of wood sawing jobs. Engine is 3½ hp., single-cylinder, two-cycle, air-cooled gasoline. An automatic clutch stops the chain when the engine idles. Cutting bars are 18 to 42-inch, and cut at any angle with a level engine. Attachments include the straight, pinchless and bow chain saws; mobile land clearance saw; earth and wood augers; grinder; disc sander; wood drill; vibratory hole borer; sump pump; high pressure fire pump; wire brusher; concrete surfacer, and mass and form concrete vibrators. More from Mall Tool Company, 7725 South Chicago Avenue, Chicago 19, Ill. or circle No. 1-15 on the coupon.

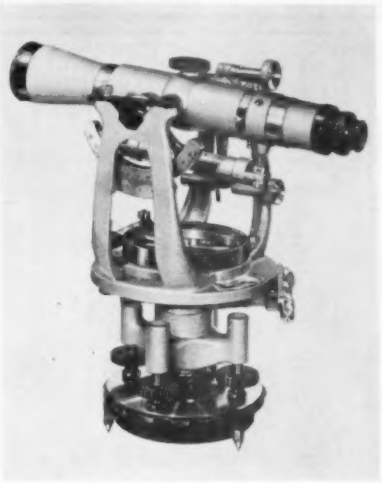
Triplex Mower Speeds Roadside Maintenance Work

This is a self-propelled, three-gang, ride-on mower for golf courses, highways, parks and institutions. With a 7½-hp engine, mowing speeds up to 8 mph are possible; and over normal terrain 30 acres



per day can be mowed. The mowers cut ahead of the wheels, and the swath width is 85 ins. The side-wing mowers can cut 45° above or below horizontal, and these can be raised and stopped to permit passage through narrow openings. More from Worthington Mower Co., Stroudsburg, Pa., or circle No. 1-16 on the coupon.

Transit-level. This instrument has been changed in appearance and improved in design and construction so that it now looks like and can be operated as a transit; however, it retains the exclusive feature of being adjusted like a Wye level. New construction features include a 24 power internal focusing telescope; coated optics; sealed in ob-



Transit-Level features adjustments of Wye level; operates as a transit

jective; larger eyepiece cap and larger vertical arc. Further details from Dept. FF, Warren-Knight Co., 136 N. 12th St., Philadelphia 12, Pa., or circle No. 1-17 on the coupon.

• • •

Pneumatic Sump Pump for Trenches and Excavations

This pneumatic sump pump can be dropped in the water, eliminating priming, and can be operated by any 105 or 125 cfm air compressor. It is built with exceptionally large capacity so that dewatering can be quickly accomplished. It can also be used to handle mud and raw sewage. Small and light in weight, it can be transported easily to the job and requires small storage space. Complete data from Schramm, Inc., West Chester, Pa., or circle No. 1-18 on the coupon.

15-Yd. 4-Wheel Scraper on Rubber Tires

Allis-Chalmers has added a 15-cu. yd. struck, 19-cu. yd. heaped, capacity rubber-tired four-wheel scraper. The unit is cable controlled with positive forced ejection. It provides a 9 ft. 8-in. wide cut; overall length is 33 ft. 5 in. and width is 11 ft. 6 in. The overall height is 8 ft. 8 in. with blade on the ground, and 9 ft. 2 in. when bowl is raised. Approximate shipping weight with the 21.00x24 tires is 25,850 lbs. More from Allis-Chalmers Manufacturing Company, Tractor Division, Milwaukee 1, Wisconsin, or circle No. 1-19 on the coupon.

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Unusual opportunity for graduate civil engineer, or equivalent, with professional license, in southern Pennsylvania city. Experience is essential in land surveying, street layout, sanitary and storm water drainage, and related work. Experience is desirable in application of zoning laws and sub-division control. Successful applicant would be in responsible charge of Engineering Department, supervising survey crew and draftsmen; and would be expected to deal with the public in the many problems arising in the operation of a City Engineering Department.

Attractive salary, pleasant working conditions, permanent position for right man. No political interference. Man under 40 preferred. Reply should state age background, and specific experience in the above-mentioned fields.

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Write giving full particulars regarding personal history and work experience. Please include telephone number.

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MUNICIPAL ENGINEER WANTED

A Registered Municipal Engineer is wanted with executive ability to manage the Public Works Department of a small but growing town of 9000. Experience with water and sewage systems is a necessity. Write stating full particulars about yourself.

Write to:

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WANTED DIRECTOR OF PUBLIC WORKS

The City of Palm Springs, California, a resort community with population ranging from 5,000 to 35,000 invites applications for this position. Applicants must be registered California engineers, or have the ability to become registered. Must be capable of administering engineering services, street department, government buildings and airport maintenance, refuse and sewage disposal. Salary $506-628 depending upon qualifications. For complete information required, write or call City Manager R. W. Peterson, Box 850, Phone 2202, Palm Springs, California.

SUPERINTENDENT WANTED

Qualified Superintendent wanted with proven executive ability for large Mid-Eastern aggregate producer. Write giving full experience, references, age and salary.

Write to:

BOX 1-1

Care of this Magazine

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Byers crawler mounted crane, wgt. 33 T. cap. 1¼ yd. Hercules gas motor, 40-ft. boom, double drums lagging and wire rope lines, also spare parts. Ideal for coal or gravel yard. Excellent condition. Ready for work. Located on Rt. 7, Bridgeport, Ohio. Price FOB car $2,500. Will consider trade for '52 or '53 Cadillac.

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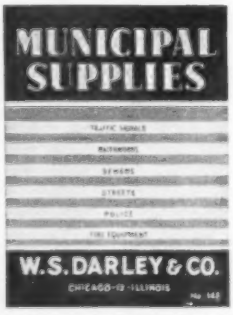

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Care of this Magazine

Aluminum Dump Bodies Weigh Less, Carry More Pay Load

All-welded aluminum dump bodies are now available in various lengths, with 7-ft. inside width and standard 32-in. depth. The 12-ft. body, with hoist, in aluminum weighs 2200 pounds; the 15-ft. body 2500 lbs.; and the 20-ft. body 5500 pounds. With load limits enforced, these lower body weights result in larger pay loads and increased profits. Write Penn Body Div., Hockensmith Corp., Penn, Pa., or circle No. 1-20 on the coupon.

Atlanta Marks School and Downtown Crossings

Contracts were let early in December to the J. W. Goldsmith Company of Atlanta, Ga., to lay approximately 28,000 feet of four-inch "Veon" crosswalk traffic lines at school and downtown crossings. This is the first large contract in the Southeast for the application of this plastic-base street marking compound. The contract followed the satisfactory results of test markstantly studying to improve the signing program.

The Goldsmith Co. will handle the Veon products and make applications in Georgia, Alabama, South Carolina, Florida and part of Tennessee. The special equipment necessary to lay the Veon lines is leased by the parent organization, Veon Chemical Co., Long Island City, N. Y. For more data circle 1-21 on on coupon.

Paints for Water Treatment Plants

A detailed survey of water treatment plant painting practices and problems, conducted by The Tropical Paint Co., has been incorporated in a 15-page booklet "Recommended Maintenance Painting Systems for Water Treatment Plants." This presents 13 approved systems of maintenance painting to meet all conditions. Copies are available from Tropical Paint Co., Cleveland 2, Ohio, or circle No. 1-22 on coupon.

• • •

Large and Complete Sanitary Engineering Laboratory

What is said to be the largest and best equipped unendowed sanitary engineering laboratory in the southeast, has been opened by Watson & Hart, consulting engineers of Greensboro, N. C. This laboratory, which was designed to provide all necessary services for the analysis of water and waste problems, is in

charge of John C. Grey, formerly chief engineer for the North Carolina Stream Sanitation Commission. Mr. Grey is also responsible for the design of the laboratory.

Ohio Water Clinic Conference

The Fourth annual Ohio Water Clinic Conference will be held at the Ohio State University Feb. 17 and 18. K. W. Cosens, Civil Engineering Department, OSU, Columbus 10, Ohio, is Director.

Southern Municipal and Industrial Waste Conference

The Fourth Southern Municipal and Industrial Waste Conference will be held at the College of Engineering, Duke University, Durham, N. C., March 31 and April 1. J. W. Williams is acting head of the CE Dep't.

Instrument Short Course

The Fourth Annual Instrument Short Course will be held Jan. 27 and 28 at Los Angeles Harbor Junior College, Wilmington, Calif. For details, write J. R. Wilson, 640 Fillmore St., Fillmore, Calif.

Ohio Water & Sewage Personnel Certification

A certification examination for Ohio water and sewage treatment plant personnel will be held April 22. Applications must be made on or before March 1 to John E. Richards, State Department of Health, Columbus 15, Ohio.

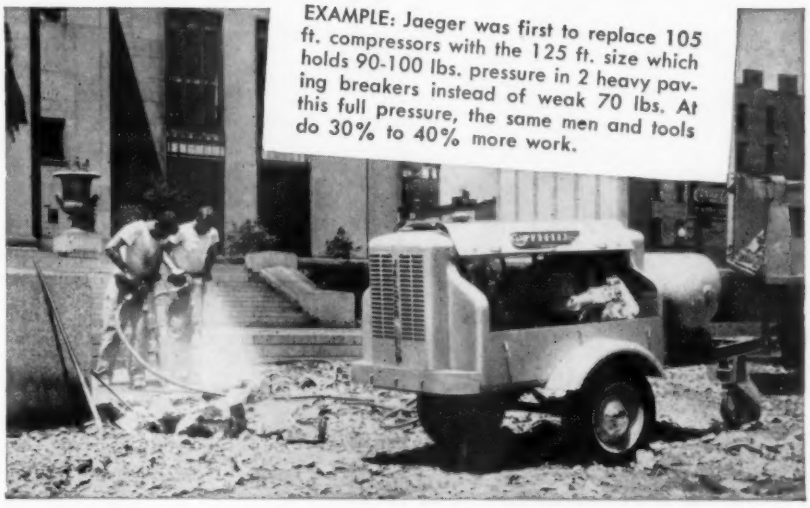
UNC To Help Peru Sanitary Engineering

The University of North Carolina has contracted with the Institute of Inter-American Affairs to assist in sanitary engineering work in Peru. Purposes of the project are to integrate laboratory teaching into the 5-year sanitary engineering undergraduate program of the National School of Engineering and initiate and develop sanitary engineering research. Staff members engaged on the project will include Profs. Emil T. Chanlett, Marvin L. Granstrom and Daniel A. Okun.

Wanted: An Engineer Who Can Write

An excellent permanent position is open to a young graduate civil engineer, preferably under 30, who can write clearly and quickly. Background in highway engineering preferred but not essential. Broad opportunity for advancement and progress in engineering. Location in the East. Send full data with first letter to Box 1-E, Public Works Magazine, 310 East 45th St., New York 17, N. Y.

Jaeger "air plus" puts full wallop into any set of tools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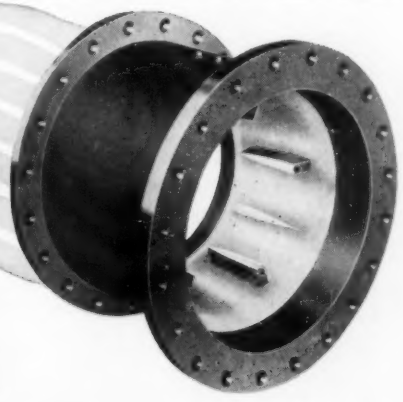

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LOW INSTALLED COST... Average length is only 1½ times the pipe diameter, and straight runs entering and following are not required unless installed near throttling valves or regulators.

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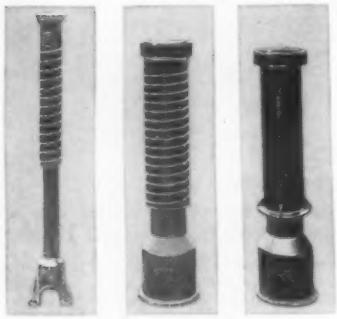

Durability and strength are embodied in every "Buffalo" casting and that means years of extra service that is trouble-free. Each step in the production of a Buffalo Pipe casting is carefully engineered, supervised and controlled — thus producing strong, quality castings to any physical or metallurgical specifications.

For quotations, write to Dept. H

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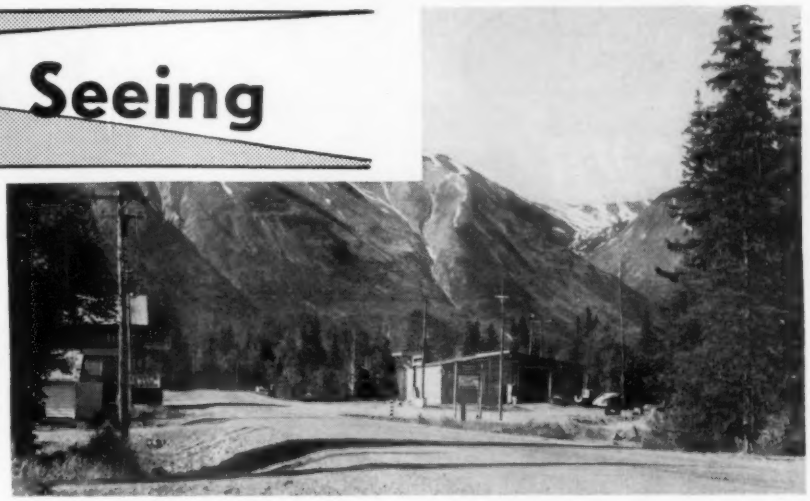
—Worth Seeing



Two Caterpillar 50 KW diesels operate alternately in Moose Pass, against the chilly backdrop of these rugged Alaskan mountains, to furnish the entire electric power supply. Estes Brothers, owners, also run the store and garage shown on either side of the territorial community's "main drag."

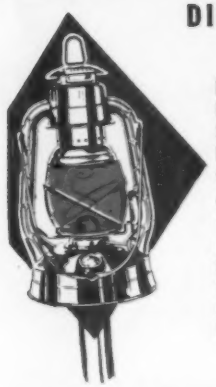
Blaw-Knox Company, Pittsburgh, fabricated these traveling steel forms for lining the second Waldo tunnel, San Francisco, paralleling the old Waldo tunnel ending in Marin City, Calif. Forms are 46 feet 6 inches wide, 28 feet 8 inches high, self supported. Guy F. Atkinson & Co., South San Francisco were contractors for this lining work. Tunnel will open soon.

Governors Away! Here are Governor George N. Craig of Indiana and Frank Lausche of Ohio gaily leading off in an Allis-Chalmers HD-20 tractor in the start of construction for the new $280 million northern Indiana toll road, vital link in the superhighway systems connecting New York and Chicago. This brings the Chicago area into the network.

"Design for Excavating" is the new 12-minute color film offered by Caterpillar-Hyster dealers or the Hyster Co., Portland 8, Ore. This "still" shows versatility of the Hyster Hystaway mounted on a Caterpillar tractor. It's convertible: shovel, backhoe, dragline, clamshell, crane, pile driver or bulldozer.

This Athey 125 HiLoader is a self-propelled conveyor that can make quick work of snow removal in your streets. Loads up to 25 cubic yards of windrowed snow per minute. Operator can cast his load anywhere within a 90° arc. Hydraulic control allows one truck to get into position while another is being loaded. Up to 10 cubic yards per minute of dirt and other materials can also be loaded.

DIETZ
SIGNALS of SAFETY

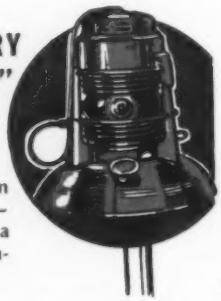


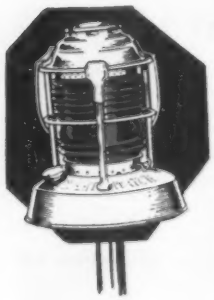
DIETZ TUBULAR LANTERNS

RED says DANGER. DIETZ LANTERNS say STOP. Light as needed, bright, or controlled without diminishment or failure till the last drop of kerosene. Rugged quality, economical performance. Backed by the oldest and largest manufacturer of portable light.

DIETZ-EMBURY "TRAFFIC-GARD" SAFETY LANTERN

"Magnified beam" seen for great distances—burns 100 hours on a pint of kerosene. Non-tip base.





DIETZ "NIGHT WATCH" SAFETY LANTERN

A miniature beacon with the new "Pencil Beam" visible from any direction close by or at long distances. Rugged, inexpensive, longest-burning, over 100 hours.

DIETZ HIGHWAY TORCHES

Complete line of bomb and flat base types in DIETZ Blue threaded collar burner models and DIETZ—EMBURY Red Cam lock burner models. Made to give faultless service under most severe conditions.

Send for Descriptive Folders

R. E. DIETZ COMPANY
EST. SYRACUSE 1, N. Y. 1840

WORTH TELLING

by Arthur K. Akers

★ HAPPY NEW YEAR! And a prosperous one. Usually we enter into prophecy with all the dash and verve of a three-toed sloth with anaemia, but this time we stick our neck out: 1955 is going to be a *good* year.

★ The CHAPMAN VALVE & MANUFACTURING CO. announce the election of Ernest Cochran, formerly executive vice-president, to the office of president and general manager, succeeding John J. Duggan, recently deceased. This is Mr. Cochran's 38th year with Chapman.

★ GREET G. Donald Kennedy, new president of the Portland Cement Association, succeeding Carl D. Franks, retiring after 38 years with the Association.

Mr. Kennedy

Mr. Humes

★ ADD well-merited promotions: R. W. (Bob) Humes to assistant sales manager, Sherman Products, Inc., Royal Oak, Mich. Donald C. Zuhlsdorff assumes the post of assistant advertising and sales promotion manager for Sherman.

★ VERTICAL TURBINE PUMP ASSOCIATION elects Warren L. Bremer, president (Layne & Bowler Pump Co., Los Angeles); William H. Reeves, vice-president (Layne & Bowler, Inc., Memphis); B. A. Tucker, secretary-treasurer (Peerless Pump Div., Los Angeles).

★HEIL COMPANY, Milwaukee, appoints new distributors in Iowa and Indiana, and announces new bulletin HH 54110 on their extra heavy duty dump bodies and full line.

★ LAWRENCE E. MacDONALD is new general sales manager, Bucyrus-Erie Co., South Milwaukee.

★ PAK-MOR MANUFACTURING CO., San Antonio, appoints David R. Neighbor of Houston export sales representative for these refuse bodies outside of continental North America. He recently placed Pak-Mors in Caracas, Venezuela, and Bogota, Colombia.

★ SOUTHWARD "The course of empire" . . . This time it's the Norton Co., Worcester, Mass., building a new plant in Huntsville, Ala. to add to its electric furnace capacity.

★ So we helped Caterpillar Tractor celebrate the 50th anniversary of the track-type tractor, in New York, in Chicago, and in San Francisco. Pleasantly—and profitably. And saw their new sound film, "The Perfect Crime." Its theme is construction safety.

★ E. H. SHELTON moves to New York in the newly-created position of general sales manager, Tennessee Corporation, Atlanta. Also, L. S. Kaniecki is promoted to manager of chemical sales, with H. G. Cunningham as assistant, both in Atlanta.

★ E. GEORGE BAKER is now assistant sales manager of the Mueller Company's Los Angeles division.

★ ACKER DRILL CO., Scranton, Pa., has built a new plant, adding over 35,000 square feet of floor space the better to care for increasing demand for Acker drilling equipment and brand new earth digger.

★ THE EIMCO CORPORATION, Salt Lake City, announces its new Research and Development Center, with every known type of filtration equipment at work in it.

★ LEONARD H. LEE is now sales engineer for Baughman Manufacturing Co. Territory, all the U. S. east of the Mississippi river, except Wisconsin and Illinois. Means of covering it, one of the Baughman Cessna planes.

★ HE: "You ought to see the beautiful new altar at our church."
SHE: "Lead me to it."

HUBER
WARCO

TWO FAMOUS NAMES IN ROAD MACHINERY

BECOME ONE!

The Huber Manufacturing Company of Marion, Ohio, and the W. A. Riddell Corporation of Bucyrus, Ohio, are now combined in the new HUBER-WARCO COMPANY with headquarters in Marion.

Our combined lines include the following:

HUBER-WARCO MOTOR GRADERS: 4D-75, 4D-85 and 4D-115.

HUBER-WARCO MAINTAINER: With versatile attachments for service as a bull-dozer, grader, broom, snow plow, berm leveler, lift-loader, side-dozer, road planer, mower or patch roller.

HUBER-WARCO TANDEM ROLLERS: 3-5, 5-8, 8-10, 8-12 and 10-14 ton.

HUBER-WARCO 3-WHEEL ROLLERS: 5, 6, 7, 8, 10, 12 and 14 ton. 8-10, 10-12 and 12-14 ton variable weight.

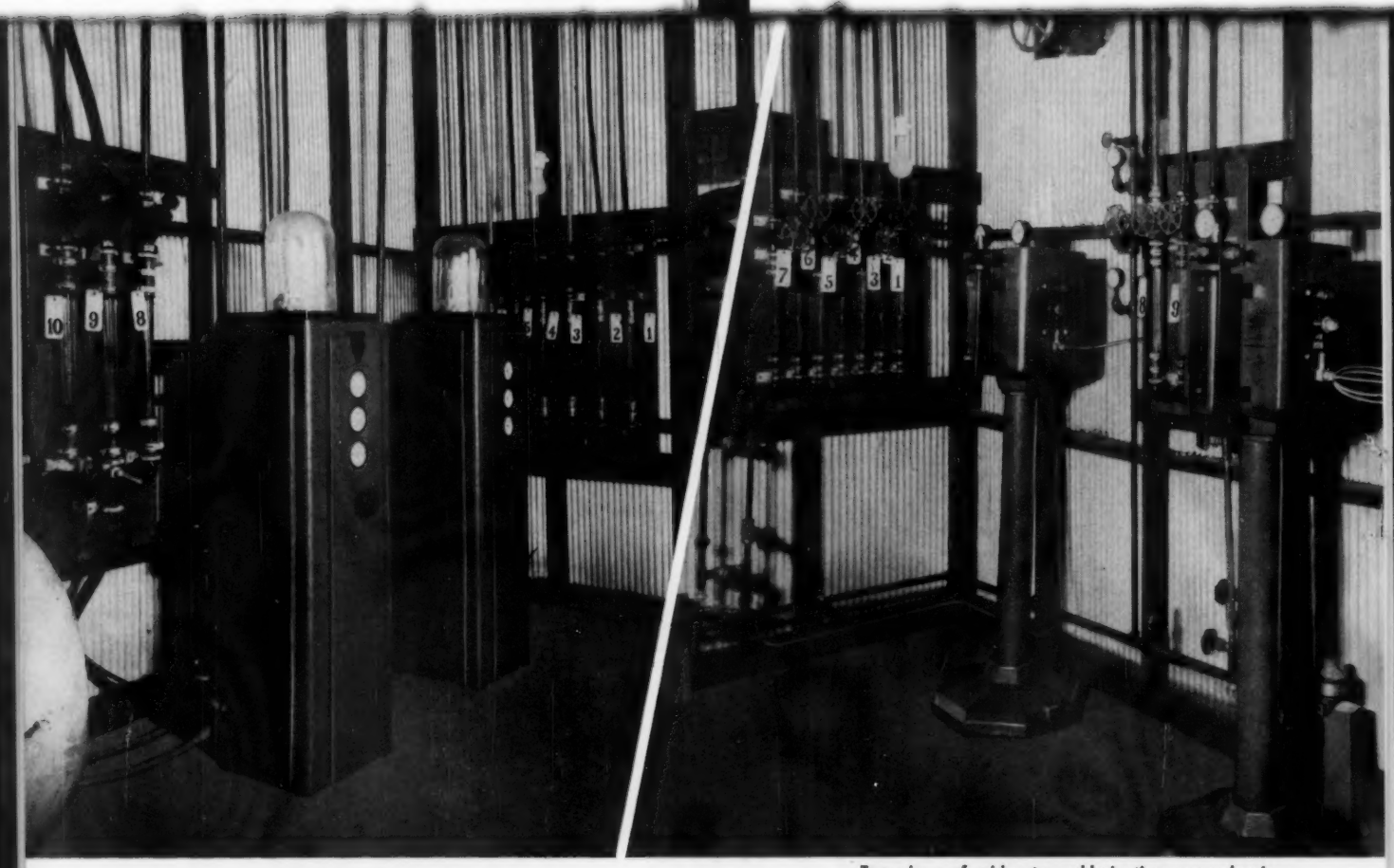
HUBER
WARCO

HUBER-WARCO COMPANY

Road Machinery

MARION, OHIO, U.S.A.

Road Rollers • Maintainers • Motor Graders



Two views of midwestern chlorinating room showing typical use of W&T equipment to suit a specific need.

To Every Part Its Proper Place . . .

How well chlorination equipment does its job depends not only on proper design but on the selection of the right parts and materials for every specific purpose.

The W&T equipment in the above installation is still giving good service after fifteen years. Every part in the equipment shown was designed specifically to meet a particular need. Mechanical diaphragms, first used by W&T in 1913, are here used for accurate control in the ammoniators. Puncture proof water diaphragms provide visibility and accessibility of control parts in the chlorinators. Both orifice and manometer type meters, and rotameters (furnished in W&T equipment as early as 1917), are employed here as best suiting the purpose for which each was intended.

Since 1913, W&T research has consistently sought out new designs, principles, and materials. Every new development is placed under rigid field tests to prove it can meet the exacting standards and practical limitations that dependable and economical chlorination demands.

When you depend on W&T equipment, you have the assurance that 40 years of experience in the chlorination field is being used to bring you the best in design, parts, and materials—selected and tested specifically to fit the need.

"Make Your First Choice Chlorination That Lasts"

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

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